

Maintenance Manual

"22 Series"
Comm/Nav System

TA-22B VHF Transmitter
RA-22B VHF Receiver
NVA-22A Navigation Unit
and Accessories

Manual Number
I.B.1022
NAVAIR 16-45-109

Bendix Avionics Division

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REVISION NO. 2

to

INSTRUCTION MANUAL I. B. 1022

covering

"22 Series" COMMUNICATION and NAVIGATION EQUIPMENT

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NAVAIR 16-45-109

"22 Series" COMMUNICATION and NAVIGATION EQUIPMENT

REVISION NO. 2

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REVISION NO. 2

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Pages that have been revised are outlined below together with the highlights of the revision.

<u>PAGE NUMBER</u>	<u>DESCRIPTION OF CHANGE</u>
Title Page	New format added.
iv	Description of figures 2-4 and 3-10a corrected.
1-1	Typing error corrected. Table 1-1 Nomenclature corrected for PSA-21C and PSA-21D Power Supplies.
1-2	Adaptor weight corrected. Channel reference in first paragraph of paragraph 1-2. B. corrected.
1-9	Typing error corrected. Altitude reference in Table 1-4 corrected.
1-11	Temperature reference in Table 1-5 corrected.
1-12	Table 1-6 updated and corrected.
1-13	Typing error corrected. Paragraph reference in paragraph 1-2. I. 1. corrected.
2-2	Item number changed in fourth paragraph of paragraph 2-1. A. 1. a.
2-4	Figure reference deleted. Typing error corrected.
2-5	RA-22() reference changed to RA-22B. Grammatical error corrected.
2-6	Figure reference corrected in paragraph 2-1. D.
3-1	Reproducible Drawing reference deleted.
3-5	Figure 3-2 updated.
3-11	Figure 3-7 updated.
3-14	Drawing number reference added to figure 3-10.
3-14a	Figure 3-10a updated.
3-18a	In title reference, NVA-22 changed to TA-22.

Maintenance
Manual

ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL, AND ENTER DATE INSERTED AND INITIALS.

PURPOSE OF MANUAL

This manual provides the information required for the installation and testing, in the aircraft, of the Bendix "22 Series" Communication and Navigation Equipment.

The following table lists the Bendix "22 Series" equipment and accessories which have been assigned AN nomenclature.

<u>BENDIX TYPE NO.</u>	<u>BENDIX PART NO.</u>	<u>AN NOMENCLATURE</u>	<u>TITLE</u>
RA-22B	2087698-0502	R-1185A/ARC-101	Receiver, Radio
TA-22B	2086758-2	T-907A/ARC-101	Transmitter, Radio
NVA-22A	2086412-1	CV-2059/ARN-87(v)	Converter, Navigation Set
4RAX-21/22	2065051-0501	MK-904/ARC	Mod. Kit, Electronic Equipment
CNA-22YSV-1A	2067084-0001	C-6842/ARN-87(v)	Control, Radio Set
CNA-22YSV-1AG	2067084-0003	C6844/ARN-87(v)	Control, Radio Set
CNA-22YSV-1B	2067084-0002	C6843/ARN-87(v)	Control, Radio Set
CNA-22YSV-1BG	2067084-0004	C6845/ARN-87(v)	Control, Radio Set
CNA-22YCS	2087327-17	C4616/ARC-101	Control, Radio Set
PSA-21A	N2085564-1	PP-2688/ARC-84	Power Supply
PSA-21B-1	N2086021-1	PP-2448/ARC-84	Power Supply
PSA-21C	N2085527-1	PP-2687/ARC-84	Power Supply
PSA-21D-1	N2086220-1	PP-2449/ARC-84	Power Supply
MTA-21A	R240635-3	MT-3593/ARN-87(v)	Mounting
MTA-21CG	2065109-0501	MT-3595/ARN-87(v)	Mounting
MTA-21D	R2085474-1	MT-2248/ARC-84	Mounting
MTA-21DG	2065110-0501	MT-3597/ARC-101	Mounting
MTA-21E	R240635-5	MT-3594/ARN-87(v)	Mounting
MTA-21EG	2067484-0001	MT-3596/ARN-87(v)	Mounting

Of special interest to the MILITARY is an interconnecting wiring diagram showing the interconnect cabling of Radio Set AN/ARC-101 (figure 3-20).

For a more detailed description of the basic units of the "22 Series", test and maintenance procedures, and spare parts lists, refer to the following separate Maintenance Manuals:

<u>EQUIPMENT</u>	<u>INSTRUCTION MANUAL</u>
TA-22B Transmitter	I. B. 1022A-1 NAVAIR 16-45-110
RA-22B VHF Receiver	I. B. 1022B-1 NAVAIR 16-45-111
NVA-22A Navigation Unit	I. B. 1022C NAVAIR 16-45-1076
CNA-22 () Control	I. B. 1022D NAVAIR 16-45-112

"22 SERIES" COMM/NAV SYSTEMS

SERVICE BULLETINS

The following list of service bulletins apply to the equipment covered in this manual.
Copies of these bulletins are available upon request to:-

Bendix Avionics Division, Dept. 373
2100 N.W. 62nd Street
Fort Lauderdale, Florida 33310

SERVICE BULLETIN NUMBER	DATE OF ISSUE	EQUIPMENT TYPE	PURPOSE OF BULLETIN

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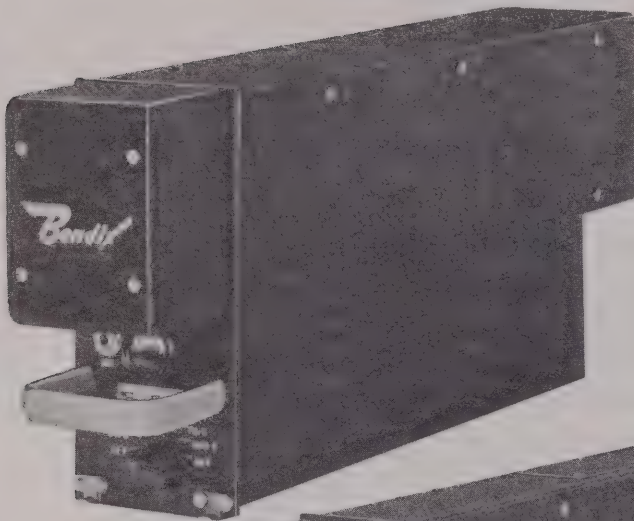
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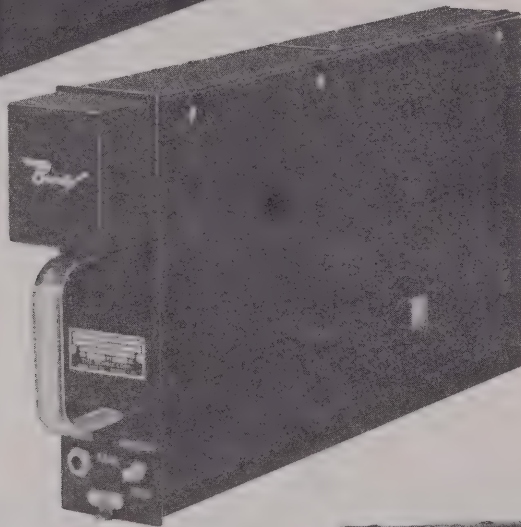
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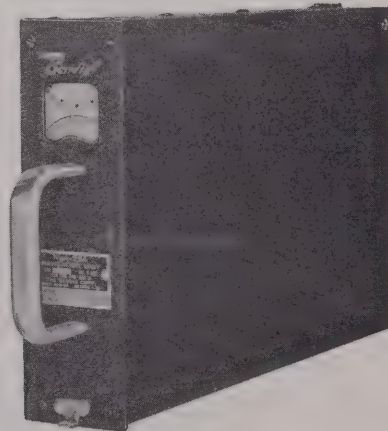
SECTION I
DESCRIPTION OF EQUIPMENT
"22 SERIES" COMM/NAV SYSTEMS



TA-22B VHF TRANSMITTER



RA-22B VHF RECEIVER



NVA-22A NAVIGATION UNIT



CNA-22YSV-1 CONTROL

Figure 1-1. "22 Series" Communication and Navigation Equipment

SECTION I
DESCRIPTION OF EQUIPMENT
"22 SERIES" COMM/NAV SYSTEMS

SECTION I. DESCRIPTION OF EQUIPMENT

1-1.PURPOSE OF EQUIPMENT

The equipment comprising the Bendix "22 Series" COMM/NAV Systems provides high-quality transmission of air-ground voice communications, over an extended frequency range, and reception of navigation and aural signals on VOR and ILS localizer channels. The equipment is especially adaptable to the operational needs of military, tactical, and transport aircraft, and is equally valuable to airline and business aircraft that use military facilities.

1-1.A. COMPONENTS OF "22 SERIES"

The Bendix "22 Series" of communications and navigation equipment includes the several items listed in table 1-1 under "22 Series" heading. Auxiliary equipment, for use with the "22 Series" equipment, is listed in table 1-1 under AUXILIARY EQUIPMENT AVAILABLE heading.

TABLE 1-1.
EQUIPMENT AVAILABLE

TYPE	NOMENCLATURE	OUTLINE DRAWING (Figure)	WEIGHT (POUNDS)
<u>"22 SERIES"</u>			
ANA-22()	Antenna, VHF COMM	3-24	
CNA-22YCS	Control, COMM (116.00-149.95 mc)	3-2	1.6
CNA-22YSV	Control, COMM/NAV (108.00-149.95 mc)	3-3	1.6
CNA-22YSV-1()	Control, COMM/NAV (108.00-151.95 mc)	3-3	1.6
NVA-22A	Navigation Unit	3-6	9.0
RA-22B	Receiver, VHF	3-7	8.5
4RAX-21/22	Super Squelch	-	.28
TA-22B	Transmitter, VHF	3-9	12.6
AUXILIARY EQUIPMENT AVAILABLE			
INA-21()	Indicator	3-1	1.9
MN-72G()	Radio Magnetic Indicator	3-4	2.5
MTA-21A	Shockmount (for RA-22B)	3-10	1.6
MTA-21B	Shockmount (for TA-22B)	3-11	1.6
MTA-21C	Shockmount (for RA-22B/NVA-22A)	3-12	2.1
MTA-21CG	Shockmount (for RA-22B/NVA-22A)	3-12a	2.1
MTA-21D	Shockmount (for RA-22B/TA-22B)	3-13	2.6
MTA-21DG	Shockmount (for RA-22B/TA-22B)	3-14a	2.6
MTA-21E	Shockmount (for NVA-22A)	3-10	1.6
MTA-21EG	Shockmount (for NVA-22A)	3-10a	1.6
MS-192C	Antenna, VHF NAV	3-5	5.75
PSA-21A	Power Supply, AC (for RA-22B)	-	.5
PSA-21B-()	Power Supply, DC (for RA-22B)	-	.53
PSA-21C	Power Supply, AC (for TA-22B)	-	3.5
PSA-21D	Power Supply, DC (for TA-22B)	-	2.5
PSA-21D-1	Power Supply, DC (for T-907/ARC-101)	-	2.5
RMA-21A	RMI Amplifier	-	.19
RMA-21B	RMI Amplifier	3-8	.62

SECTION I
DESCRIPTION OF EQUIPMENT
"22 SERIES" COMM/NAV SYSTEMS

1-1PURPOSE OF EQUIPMENT

TABLE 1-1. (Con't)
EQUIPMENT AVAILABLE

NOMENCLATURE	OUTLINE DRAWING (Figure)	WEIGHT (POUNDS)
ADAPTOR, Shockmount (3/8 ATR Case to 1/2 ATR Mount)	3-14	1.62
ADAPTOR, Shockmount (1/4 ATR Case to 1/2 ATR Mount)	3-15	1.31
ADAPTOR, Shockmount (1/4 ATR Case to 3/8 ATR Mount)	3-16	.38

1-2DESCRIPTION OF EQUIPMENT1-2.A. GENERAL

A brief description of each major unit of the "22 Series" equipment is given in the following paragraphs. A summary of typical characteristics for each major unit is included.

Primary power requirements for all units are consolidated in table 1-7.

1-2.B. TA-22B VHF TRANSMITTER

The TA-22B provides crystal controlled SC (single channel) transmission on 680 channels spaced 50 kc apart in the frequency range of 116.00 mc to 149.95 mc. Channel selection is accomplished by use of a remote control panel. A series of CNA-22() Controls has been developed for this purpose.

R-f power of at least 25 watts is available from 116.00 mc to 137.95 mc, and a minimum of 20 watts is available from 138.00 mc to 149.95 mc. A 0.25-volt, 1000-cycle microphone input is sufficient to provide 90 percent amplitude modulation. The transmitter has a microphone input for voice signals and another input for ATCSS signals from a separate signalling unit. The TA-22B is keyed by a push-to-talk button on the microphone. During transmission the TA-22B supplies 27.5 volts to the receiver disable switch to squelch the receiver audio. An antenna changeover relay is also located in the transmitter.

For test purposes, a microphone jack, labelled MIC, is located on the front panel. A meter and meter-function switch is provided to monitor the current in the intermediate power amplifier grid (IPA-G), the power amplifier grid (PA-G), and cathode (PA-C), the modulator collector (MOD-C), and the antenna (ANT). A sidetone output permits earphone monitoring of the transmitted signal.

The TA-22B requires +27.5-volt input power to the switching and transistor circuits. In addition, a separate power supply is required to provide power for the vacuum tubes. The power supply is a separate type numbered unit which is normally mounted in the space provided in the transmitter. Either an a-c power supply (PSA-21C), operating from a 115-volt 300- to 1000-cps source, or a d-c power supply (PSA-21D-1), operating from the 27.5-volt d-c source, may be used. Each power supply provides +250 and +500 volts dc for the B+ supply. In addition, the a-c power supply provides 6.3-volts ac to the tube filaments; the d-c power supply connects the tube filaments to the +27.5-volt d-c source, in a parallel-series combination that puts 6.3-volts dc across each filament.

The TA-22B VHF Transmitter is housed in a short 3/8-ATR case with a front and a rear projection.

1-2.B.1. PSA-21C Power Supply (ac)

This a-c power supply is designed to operate from a 115-volt, 300- to 1000-cps source. Eight silicon diodes, forming two bridge rectifier circuits, are used to supply B+ voltages of 250 and 500 volts.

1-2.B.2. PSA-21D and PSA-21D-1 Power Supplies (dc)

These d-c power supplies use four transistors in a bridge oscillator circuit powered by +27.5-volt d-c aircraft power. The nominal operating frequency of the bridge oscillator is 1260 cps. A saturable-core

SECTION I
DESCRIPTION OF EQUIPMENT
"22 SERIES" COMM/NAV SYSTEMS

1-2DESCRIPTION OF EQUIPMENT

power transformer applies a stepped-up voltage to two bridge rectifiers that produce the 250- and 500-volt B+ voltages. The d-c power supply contains jumpers and resistors that balance the vacuum tube filament circuits to apply 6.3-volts dc across each filament.

1-2.B.3. Shockmounts

Refer to table 1-6 for complete information on shockmounts available and connector types.

1-2.B.4. Summary of Typical Characteristics - TA-22B VHF Transmitter

A summary of typical characteristics of the TA-22B VHF Transmitter is given in table 1-2.

TABLE 1-2.
SUMMARY OF TYPICAL CHARACTERISTICS - TA-22B VHF TRANSMITTER

Form Factor	3/8-ATR (short)
Weight and Dimensions	See figure 3-9
Frequency Range	116.00 to 149.95 megacycles
Number of Channels	680
Channel Spacing	50 kc
Input Impedance	
Microphone	100 ohms
ATCSS	150 ohms (approximately)
Output Impedance	52 ohms
Output Power	25 watts from 116.00 to 137.95 megacycles 20 watts from 138.00 to 149.95 megacycles
Temperature Range	
(Ambient)	-40°C to +55°C (-40°F to +131°F)
Humidity Range	Up to 95% relative humidity
Operating Altitude	Up to 55,000 feet
Channeling Time	4 seconds maximum
Frequency Stability	±0.005%
Modulation Capability	With a 0.25-volt rms 1000-cycle sine-wave input to the microphone transformer, the modulator is capable of modulating the r-f carrier 90%
Modulator Frequency	Flat within 6 db from 300 to 3500 cps (Microphone input); flat within 6 db from 300 to 10,000 cps (ATCSS input)
Audio Frequency Distortion	Will not exceed 10% at 90% modulation with 1000-cps input and no clipping
Sidetone Output	With 90% modulation, the transmitter will deliver 100 milliwatts of sidetone signal into a 500-ohm load
Speech Clipping	Adjustable to 10 db
Noise Level	The S+N to N level is down 40 db at 90% modulation
Vibration	10 to 55 cps— 0.06-inch total excursion per RTCA Paper 100-54/DO-60

SECTION I
DESCRIPTION OF EQUIPMENT
"22 SERIES COMM/NAV SYSTEMS

1-2

DESCRIPTION OF EQUIPMENT

TABLE 1-2. (Con't)

SUMMARY OF TYPICAL CHARACTERISTICS - TA-22B VHF TRANSMITTER

Shock	15G operate—30G impact per RTCA Paper 100-54/DO-60			
Duty Cycle	5 minutes ON—5 minutes OFF			
Radiation				
Harmonic	60 db below carrier (min)			
Spurious	80 db below carrier (min)			
Power Requirements	Refer to table 1-7			
Tube and Transistor	Tubes		Transistors	
Complement	Three	5654	Five	2N2270
	One	5670	Two	2N174
	One	5725	One	2N656
	One	5686	One	TS774
	One	6252	One	2N657
			One	2N144/13
Certification	TSO-C37a, Cat. B			

1-2.C. RA-22B VHF RECEIVER

The RA-22B provides reception of VHF signals on 880 crystal-controlled communications, VOR, and ILS localizer channels, spaced 50 kilocycles apart, over the 108.00- to 151.95-megacycle range. Channel selection is accomplished by electric control from a remote control panel.

Two separate audio outputs are provided; one with a restricted bandwidth for voice communications; the other, essentially flat from 30 cps to 10 kc, for VOR, ILS localizer, and ATCSS signals.

An agc operated squelch circuit is included in the equipment to mute the communications audio output until the rf rises above a predetermined level. This level is set by a SENS screwdriver adjustment on the front panel of the RA-22B. The squelch level may also be remotely controlled. A SQUELCH TEST pushbutton on the front panel permits the squelch to be disabled for test purposes. The squelch is automatically disabled when the RA-22B is tuned to a VOR or localizer channel. During transmission a +27.5-volt receiver disable signal is supplied by the associated transmitter unit to operate the squelch circuit.

The RA-22B provides a nominal voice output of 100 milliwatts across a 500-ohm load. Because of the low output impedance, the output level in a headset will remain constant whether other headsets are added or removed. A front panel AUDIO jack is provided for monitoring the voice output of the unit.

The RA-22B requires a 27.5-volt input to supply power for the switching and transistor circuits used in the equipment. In addition, the RA-22B requires a separate power supply to provide power for its vacuum tube circuits. The power supply is a separately packaged unit which is normally mounted inside the RA-22B. Either an a-c power supply (PSA-21A) operating from a 115-volt 300- to 1000-cps source, or a d-c power supply (PSA-21B-1, or PSA-21B-2) operating from the 27.5-volt d-c source, may be used with the RA-22B.

The RA-22B is housed in a short 1/4-ATR package with a front applique.

SECTION I
DESCRIPTION OF EQUIPMENT
"22 SERIES" COMM/NAV SYSTEMS

1-2DESCRIPTION OF EQUIPMENT

Whenever a communications channel is selected (normally 118.00 to 151.95 megacycles), the frequency control circuits in the RA-22B provide a 27.5-volt output for external use. In a communications/navigation system, this voltage is used to disable the navigation unit and to switch the receiver input from the horizontally polarized antenna, which is used for navigation, to the vertically polarized antenna which is used for communications. This changeover normally occurs at 118.00 megacycles. When the RA-22B is being used in an area where the communications frequency range extends down to 116.00 megacycles, the application of a communications/navigation transfer switching voltage, from a remote switch, changes the frequency at which the RA-22B switches between the communications and navigation modes to 116.00 megacycles. This adds communications capability between 116.00 and 118.00 megacycles. The type CNA-22YSV() Controls include the switch required for this function.

1-2.C.1. 4RAX-21/22 Super Squelch (Figure 1-2)

For receiver applications where squelch sensitivity and noise rejection are important factors, the 4RAX-21/22A Super Squelch is offered as an option for use in the RA-22B. This option can be either factory installed or obtained as a modification kit for field installation. The 4RAX-21/22 is housed in the front applique of the RA-22B.

The 4RAX-21/22 contains four transistors, two crystals, and two tuned circuits. It consists of two printed circuit boards fastened together with all associated components and mounting hardware assembled and ready for installation in the receiver. The unit measures three inches by two and one-quarter inches by two and one-quarter inches (max.) and weighs approximately six ounces. It requires 10 milliamperes at 27.5 volts dc for its operation.

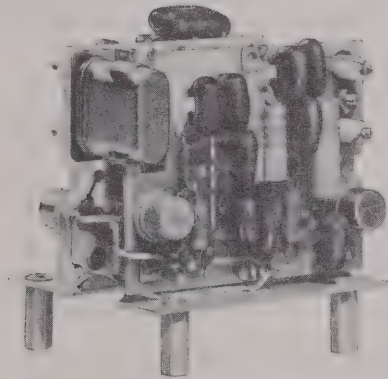


Figure 1-2. 4RAX-21/22 Super Squelch

1-2.C.2. PSA-21A Power Supply (ac)

This a-c power supply is designed to operate from a 115-volt 300- to 1000-cps source. A silicon diode, connected as a half-wave rectifier provides a B+ supply of 130 volts. A filament transformer provides 6.3 volts ac.

1-2.C.3. PSA-21B-1 and PSA-21B-2 Power Supplies (dc)

These d-c power supplies use two transistors in a free-running multivibrator circuit powered by regulated 20 volts dc from the RA-22B. The free-running multivibrator operates at a nominal frequency of 2050 cps. The plug connecting the d-c power supply to the RA-22B contains jumpers which arrange the RA-22B filament circuits in a series-parallel configuration so that +6.3 volts dc appears across each tube filament.

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1-2.C.4. Shockmounts

Refer to table 1-6 for complete information on shockmounts available and connector types.

1-2.C.5. Summary of Typical Characteristics - RA-22B VHF Receiver

A summary of typical characteristics of the RA-22B VHF Receiver is given in table 1-3.

TABLE 1-3.

SUMMARY OF TYPICAL CHARACTERISTICS - RA-22B VHF RECEIVER

Form Factor	1/4 ATR (short) with front applique	
Weight and Dimensions	See figure 3-7	
Frequency Range	108.00 through 151.95 megacycles	
Number of Channels	880	
Channel Spacing	50 kc	
Antenna Input Impedance	52 ohms, VSWR not exceeding 2.5:1	
Headphone Audio		
NAV Channels	100 mw into 500 ohms from 30 percent modulation at 1000 cps	
COMM Channels	100 mw into 500 ohms from 90 percent modulation at 1000 cps	
Output		
NAV and ATCSS Output	0.5-volt rms into 1000 ohms, within 2 db from 30 to 10,000 cps	
Operating Temperature Range	-40°C to +55°C (-40°F to +131°F), with 30 minutes operation at +70°C (+158°F)	
Storage Temperature	Down to -65°C (-85°F)	
Humidity Range	Up to 95 percent relative humidity	
Altitude	Up to 55,000 feet	
Duty Cycle	Continuous	
Channeling Time	4 seconds maximum	
Frequency Stability	The resonant frequency will not deviate from the selected frequency more than 0.005 percent when the ambient temperature is varied from +10°C to +70°C, or 0.007 percent from -40°C to +70°C	
Sensitivity	The S+N to N ratio is 6 db or better with 3-μv input, 30 percent modulation, 1000 cps (through 6 db pad)	
Selectivity	The bandwidth corresponding to off resonance attenuation is as follows:	
	Attenuation	Bandwidth
	6 db	40 kc min
	60 db	72 kc max

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TABLE 1-3. (Con't)

SUMMARY OF TYPICAL CHARACTERISTICS - RA-22B VHF RECEIVER

Spurious and Image Rejection	At least 80 db down (except 70 db down from 108 to 152 mc)		
Audio Response	Will not vary more than 6 db from 300 to 2500 cps. Response above 3000 cps is at least 30 db below the response at 1000 cps.		
Harmonic Distortion			
NAV Channels	10 percent maximum at 30 percent modulation, 1000 cps, 100 mw output level		
COMM Channels	20 percent maximum at 90 percent modulation, 1000 cps, 100 mw output level		
Squelch Range (Without 4RAX-21/22 Super Squelch)	Squelches receiver output until application of any preset input from 2 to 25 μ v		
With 4RAX-21/22 Super Squelch	Squelches receiver output until application of any preset input from 1 to 25 μ v		
Intermediate Frequencies	1st 15-17 mc	2nd 3.75 mc	3rd 460.0 kc
Cross Modulation	A 30 percent modulated, undesired signal, at a level 60 db above the desired signal, and removed 100 kc from the selected frequency, will not produce an output greater than 10 db below the rated output.		
Automatic Volume Control	Output will not vary more than 1 db with inputs from 10 to 50,000 microvolts.		
Tube Complement	Three 5670	Two 5654	
Transistor Complement	Six 2N169A	Two 2N440	One 2N657
	Five 4JX2A806	One 2N337A	One Tung-Sol TS774
	Three 2N525	One 2N158	One 2N333
	Two 4JX2A832	One CK919	
Diode Complement	Seven PS5062	One IN754A	(6.8V)
	Three IN461	One SV575	(8V)
	Two IN645	One IN717A	(13V)
	One IN2612	One IN1792A	(75V)
Vibration	10 to 44 cps - 0.06 inch total excursion per RTCA Paper 100-54/DO-60		
Power Requirements	Refer to table 1-7		
Certification	TSO-C36a, C38a, C40a, Category B		

1-2. D. NVA-22A NAVIGATION UNIT

The NVA-22A when operated in conjunction with the RA-22B (or equivalent) VHF Receiver and appropriate indicator instruments provides VOR/LOC information to the pilot or navigator. The NVA-22A accepts NAV signals from the associated VHF receiver when the receiver is tuned to any omni or localizer channel in the 108.00 to 117.95 megacycle band. Signal input is either:

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- | | |
|----------------------|--|
| 1) Omni Channel | 30-cps variable phase signal combined with a 9960-cps subcarrier
(Frequency modulated by a 30-cps reference phase signal) |
| or | |
| 2) Localizer Channel | 90/150-cps composite signal |

The NVA-22A converts the NAV audio into the signals necessary to operate the VOR/LOC visual indicator instruments. The signals enable the following presentations:

- 1) Visual presentation of localizer course; as presented on an OMNI-Mag indicator (such as the Bendix type MN-97), on a course indicator (such as the Bendix Type INA-21), or equivalent FPD.I.
- 2) Visual presentation of VOR (manual) course; as presented on an OMNI-Mag indicator, a course indicator, or equivalent FPD.I.
- 3) Visual presentation of heading-sensitive (automatic) VOR bearing; as presented on a dual-pointer RMI (such as the Bendix type MN-72() Radio Magnetic Indicator) or equivalent.

NOTE

Voice identification signals are obtained directly from
the associated receiver.

The NVA-22A includes a VOR-CHECK feature that provides a reliable, in-flight check on all critical areas of the automatic and manual VOR circuits. Space is provided within the unit for optional RMA-21A RMI Amplifier. An OBI (Omni-Bearing Indicator) is included as an integral part of the NVA-22A.

1-2.D.1 RMA-21() RMI Amplifier (figure 1-3)

The type RMA-21() RMI Amplifiers are offered as options for use where the compass card servo motor does not develop sufficient torque to drive the card. (Refer to paragraph 1-2.I.2.)

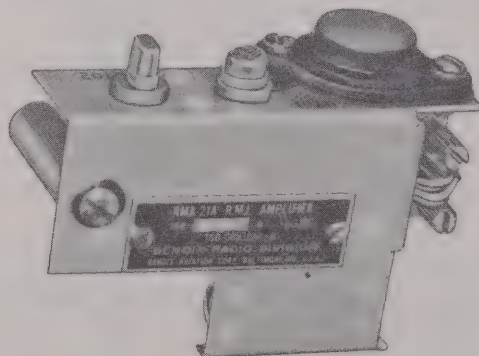


Figure 1-3. RMA-21A RMI Amplifier

1-2.D.2. Shockmounts

Refer to table 1-6 for complete information on shockmounts available, and connector types.

1-2.D.3. Summary of Typical Characteristics - NVA-22A Navigation Unit

A summary of typical characteristics of the NVA-22A is given in table 1-4.

Table 1-4.

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1-2.DESCRIPTION OF EQUIPMENT**TABLE 1-4.**

SUMMARY OF TYPICAL CHARACTERISTICS - NVA-22A NAVIGATION UNIT

Form Factor	1/4 ATR (short)
Weight and Dimensions	See figure 3-6
Output to Indicators	
Flag Warning	The NVA-22A is normally calibrated to provide flag current for parallel operation of two 1000-ohm (0-250 μ a) flag meter movements. If required, the unit can be calibrated to operate three 1000-ohm movements in parallel by removing a resistor.
Flight Path and Deviation Indicator - FPD	Manual circuitry is normally calibrated to provide deflection current for parallel operation of three 1000-ohm (150-0-150 μ a) meter movements. If required, the unit can be calibrated to operate five 1000-ohm meter movements by removing a resistor.
Ambiguity Signal	The manual circuitry normally provides TO-FROM deflection current to operate one 667-ohm (250-0-250 μ a) meter movement. If required, the unit can be calibrated to operate two 667-ohm meter movements by removing a resistor.
Response Time	The OBI is capable of shifting 180 degrees in six seconds in response to a station shift or step input signal.
Sensitivity	Sensitivity to a noise-free signal is ± 0.1 degree
Bearing Accuracy	0.5 degree at room temperature. Over the temperature range of -40°C to +55°C (-40°F to +131°F) the bearing indication will be within two degrees of that taken at room temperature.
Control	Remote; through the associated VHF receiver.
Duty Cycle	Continuous
Operating Temperature Range	
Ambient	-40°C to +55°C (-40°F to +131°F) operating; 30 minutes operating at +70°C (+158°F)
Storage Temperature	Down to -65°C (-85°F)
Altitude	Up to 50,000 feet
Humidity Range	Up to 95 percent relative humidity for 48 hours at +50°C (+122°F) with condensation once each hour.
Ventilation	Ventilation apertures in the case are arranged in patterns designed to permit maximum air flow in areas of highest temperature. An additional exhaust opening in the case is provided for operation in accordance with ARINC Report No. 404.
Vibration Limits	Ten to 55 cycles, 0.06-inch total excursion per RTCA Paper 100-54/DO-60
Shock Limits	15G operation, 30G impact per RTCA Paper 100-54/DO-60

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TABLE 1-4. (Con't)

SUMMARY OF TYPICAL CHARACTERISTICS - NVA-22A NAVIGATION UNIT

Transistor Complement	44	Seven	CK919 or GT2663	Seven	2N377
		Nine	2N525	Two	4JD1E40
		Three	2N1035	Four	CTP1245 or TS1427
		One	4JX2A806A	Two	2N333A
		Four	CDT1339 or TS1428	Four	2N333
		One	2N657		
Diode Complement	35	Two	F4	Sixteen	HD6002
		One	SV138	One	SV787 or CD32825
		Nine	HD6003	Two	S553G
		One	SV3504 or CA39079	One	1N717A
		One	SV3416 or CA39078	One	1N1115
Power Requirements	Refer to table 1-7				
Self-Test Features					
VOR-CHECK	Push-button activated circuits provide degree of error indications.				
SERVO CHECK	Flag warning of excessive error signal in 400-cycle servo loop; continuous monitoring.				
Certification	TSO-C36, C40, Cat. B.				

1-2. E. CNA-22() CONTROLS

A series of controls for the "22 Series" communications and navigation equipment includes controls for all COMM, NAV, and COMM/NAV operations as listed in table 1-5 and described in the following paragraphs.

1-2. E. 1. CNA-22YCS Control (Figure 3-2)

The CNA-22YCS Control is a communications system control panel for operation in the frequency range from 116.00 through 149.95 megacycles; it includes a remote squelch control.

Although the CNA-22YCS is essentially a communications system control, it contains the necessary switch wafers for VHF receiver, VHF transmitter, and glide slope receiver control in the 108.00 through 149.95 megacycle range. A minimum frequency stop pin is set at 116.00 megacycles and, therefore, limits the control to communications frequencies in the 116.00- through 149.95-megacycle range.

The CNA-22YCS (military nomenclature - Control, Radio Set C-4616/ARC-101) is the control used in Radio Set AN/ARC-101 which is a single communications system.

1-2. E. 2. CNA-22YSV Control (Figure 3-2)

The CNA-22YSV Control is a COMM/NAV control panel for the control of VHF receiver, VHF transmitter, and glide slope receiver in the frequency range from 108.00 through 149.95 megacycles. The CNA-22YSV includes a remote squelch control, a VOR-CHECK switch, and a communications/navigation function transfer switch.

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The communications/navigation function transfer switch when set to its NORM (or VOR) position (fully clockwise), permits normal and automatic transfer from COMM to NAV operating mode of the system at 118.00 megacycles. When the transfer switch is set to its counterclockwise position, the transfer from COMM to NAV does not take place until a frequency below 116.00 megacycles is selected. This permits communications in areas where the communicating frequency range extends down to 116.00 megacycles. When the control panel frequency selector is between 108.00 and 115.95 megacycles, the ground leads in the transmitter frequency control wafers, and the microphone press-to-talk circuit are open.

1-2. E. 3. CNA-22YSV-1() Control

The CNA-22YSV-1 Control is electrically and mechanically similar to the CNA-22YSV Control except that the range of frequency control of the CNA-22YSV-1 extends from 108.00 through 151.95 megacycles, an addition of two megacycles of control on the high frequency end. The CNA-22YSV-1A and the CNA-22YSV-1B Controls are electrically and mechanically similar to the CNA-22YSV-1 Control except for front panel markings. See figure 3-3. The CNA-22YSV-1AG Control is the same as the CNA-22YSV-1A except for 5 volt dial and panel lighting; the CNA-22YSV-1BG Control is the same as the CNA-22YSV Control except the 149.95 mc pin stop has been removed allowing frequency control of the RA-22B to 151.95 mc; the CNA-22YSV-1BG has a special 5 volt panel and dial lighting and there appears on the mask a special VOR-1/REC notation.

1-2. E. 4. Summary of Typical Characteristics - CNA-22() Controls

A summary of typical characteristics of the CNA-22() Controls is given in table 1-5.

TABLE 1-5.

SUMMARY OF TYPICAL CHARACTERISTICS AND RELATED DATA - CNA-22Y() CONTROLS

CONTROL FUNCTION	CNA-22		
	-YCS COMM	-YSV COMM/NAV	YSV-1() COMM/NAV
RANGE OF CONTROL			
Min. Freq. (mc)	116.00	108.00	108.00
Max. Freq. (mc)	149.95	149.95	151.95
REMOTE SQUELCH CONTROL	YES	YES	YES
VOR-CHECK SWITCH	NO	YES	YES
COMM/NAV TRANSFER SWITCH	NO	YES	YES
WEIGHT (pounds)	1.6		
OUTLINE DRAWING	FIG. 3-2	FIG. 3-3	FIG. 3-3
INTERCONNECTING WIRING DIAGRAM			
COMM SYSTEM	FIG. 3-17		
FOR SINGLE VHF COMM/NAV SYSTEM	FIG. 3-18	FIG. 3-18	FIG. 3-18
NAV SYSTEM		FIG. 3-19	FIG. 3-19
FOR RADIO SET AN/ARC-101		FIG. 3-20	FIG. 3-20
ENVIRONMENTAL LIMITS			
TEMPERATURE	-50°C to +70°C (-58°F to +158°F)		
HUMIDITY	UP TO 95%		
ALTITUDE	UP TO 55,000 FEET		
ON UNIT	KOA2-21L-50PN		
CONNECTOR TYPE			
MATING	KOA6-21-50SN		

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1-2DESCRIPTION OF EQUIPMENT1-2. F ANTENNAS

Antennas for the "22 Series" COMM and COMM/NAV systems include a communications antenna, and a navigation antenna.

1-2. F.1. ANA-22() VHF Communications Antenna (Figure 3-24)

The ANA-22() is a broadband, vertically polarized VHF communications antenna which provides omnidirectional radiation and reception in the 116.0 to 152.0 megacycle band. Because of its streamlined airfoil design, the ANA-22() is adaptable to almost any aircraft and is especially well suited to jet aircraft.

The antenna impedance matches a standard 52-ohm coaxial cable (such as RG-55/U or RG-58/U). VSWR is less than 2:1 over the operating frequency range. The ANA-22() complies with the requirements of Category A, RTCA Paper 120-61/DO-108. The antenna connector (type UG-1094/U) mates with a BNC connector for use with RG-55/U or RG-58/U coaxial cable.

1-2. F.2. MS-192C NAV Antenna (Figure 3-5)

The MS-192C is a horizontally polarized VHF navigation antenna designed for reception of VOR and localizer signals in the 108.0- to 121.9-megacycle band. It is constructed of aluminum and has a matching circuit in its base; the circuit is factory adjusted and requires no calibration in the field. The MS-192C is not recommended for high performance aircraft.

The antenna impedance is 50 ohms; VSWR is 5:1 maximum over the operating frequency range; weight is 5.75 pounds. The antenna connector (type RG-58/U) mates with type UG-21D/U for RG-8A/U coaxial cable, or with type UG-536/U for RG-58C/U coaxial cable.

1-2. G SHOCKMOUNTS

A series of shockmounts is available for the "22 Series" components. Table 1-6 lists the shockmounts and their associated components.

TABLE 1-6.

COMPONENT - SHOCKMOUNT CROSS REFERENCE CHART

SHOCKMOUNT	WEIGHT POUNDS	FORM FACTOR ATR	OUTLINE DRAWING	SHOCKMOUNT CONNECTOR TYPE	FOR COMPONENT	OUTLINE DRAWING	UNIT CONNECTOR TYPE
MTA-21A	1.6	Short 1/4	Fig. 3-10	DPA-29C1-33S	RA-22B	Fig. 3-7	DPA-29C1-34P
MTA-21B	1.6	Short 3/8	Fig. 3-11	Upper - DPA - 24HV2-33S Lower - DPA - 24C2-33S	TA-22B	Fig. 3-9	Upper - DPA - 24HV2-34P Lower - DPA - 24C2-34P
MTA-21C	2.1	Short Dual 1/4	Fig. 3-12	DPA-29C1-33S DPA-32-33S	RA-22B NVA-22A	Fig. 3-7	DPA-29C1-34P DPA-32-34P
MTA-21D	2.6	Short Dual 5/8	Fig. 3-13	DPA-29C1-33S Upper - DPA- 24HV2-33S Lower - DPA- 24C2-33S	RA-22B TA-22B	Fig. 3-7 Fig. 3-9	DPA-29C1-34P Upper - DPA- 24HV2-34P Lower - DPA- 24C2-34P
MTA-21E	1.6	Short 1/4	Fig. 3-10	DPA-32-33S	NVA-22A	Fig. 3-6	DPA-32-34P
MTA-21CG	2.1	Short Dual 1/4	Fig. 3-12a	DPA-29C1-33S DPA-32-33S	RA-22 NVA-22	Fig. 3-7 Fig. 3-6	DPA-29C1-34P DPA-32-34P
MTA-21DG	2.6	Short Dual 5/8	Fig. 3-14a	DPA-29C1-33S Upper - DPA- 24HV2-33S Lower - DPA- 24C2-33S	RA-22 TA-22	Fig. 3-7 Fig. 3-9	DPA-29C1-34P Upper DPA - 24HV2-34P Lower -DPA- 24C2-34P
MTA-21EG	1.6	Short 1/4	Fig. 3-10a	DPA-32-33S	NVA-22	Fig. 3-6	DPA-32-34P

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1-2DESCRIPTION OF EQUIPMENT1-2.H SHOCKMOUNT ADAPTORS

A series of three shockmount adaptors is available to enable use of shockmounts already installed but designed for earlier types of equipment functionally similar to the equipment listed in table 1-6.

1-2.H.1 Adaptor, 3/8-ATR Case to 1/2-ATR Shockmount (Figure 3-14)

This shockmount adaptor will convert a type MTA-20A, originally for a TA-20() VHF Transmitter (1/2-ATR), to mount a 3/8-ATR TA-22B VHF Transmitter.

1-2.H.2. Adaptor, 1/4-ATR Case to 1/2-ATR Shockmount (Figure 3-15)

This shockmount adaptor will convert a type MR-93B Shockmount, originally for a RA-18() or MN-85 VHF Receiver (1/2-ATR), to mount a 1/4-ATR RA-22B VHF Receiver.

1-2.H.3. Adaptor, 1/4-ATR Case to 3/8-ATR Shockmount (Figure 3-16)

This shockmount adaptor will convert a shockmount, originally designed to mount a 3/8-ATR VHF receiver having a type DPA-29C1-34P Connector, to mount a 1/4-ATR RA-22B VHF Receiver.

1-2.I. ASSOCIATED EQUIPMENT

The following equipment is compatible for use with the "22 Series" COMM, NAV, and COMM/NAV systems.

1-2.I.1. MN-72G Radio Magnetic Indicator (RMI) (Figure 3-4)

The MN-72G RMI provides two independent needles driven by standard synchro receivers and are used to present ADF or VOR operations data to the pilot. The needles are read against a rotating card which is servoed to a master heading synchro so that the aircraft's magnetic heading is always indicated at the top of the dial. An RMA-21() RMI Amplifier (Paragraph 1-2.I.3.), or its equivalent, is required to drive this card. The MN-72G also contains a standard transmitting synchro which can be used to transmit the aircraft's heading, as shown on the card, to other circuits in the aircraft. Because the MN-72G contains this transmitting synchro, it is often referred to as a "boot-strap" RMI.

1-2.I.2. INA-21A Indicator (Figure 3-1)

For manual VOR operation it is necessary to have an OBS (omni-bearing selector), an FPDI (flight path deviation indicator), a warning flag, and an ambiguity (TO-FROM) indicator. The INA-21A contains all of these features plus a glide slope needle and flag, and three marker lights.

The INA-21A uses standard 1000-ohm meter movements for the horizontal and vertical needles and the two flag warning indicators. The horizontal and vertical needle movements are 150-0-150 microamperes while the flag indicators are designed to start to move at 125 microamperes and to be completely hidden at 250 microamperes. The TO-FROM indicator has a 250-0-250 microampere movement with a resistance of 667 ohms.

The resolver in the INA-21A has two rotor windings. Only one rotor winding is required for operation with the NVA-22A. The resolver is calibrated to EZ (electrical zero) at a bearing of 300 degrees for operation with the NVA-22A. This same calibration is required if the indicator is to be used with a TACAN system. A phase-correcting network is included in the indicator to allow it to be used with VOR receivers which operate the resolver at 30 cycles and normally require an indicator that is calibrated to ORZ. With this arrangement the indicator may be used interchangeably between the NVA-22A and other VOR receivers using a rotor feed system that require an ORZ calibration. The proper calibration may be obtained by wiring either pin A or pin H of the rear connector, as noted on the schematic diagram, figure 3-26.

The INA-21A has radium paint on the numerals and indicators. The INA-21A-1 is an identical unit with matte white markings.

1-2.I.3. RMA-21() RMI Amplifier

The RMA-21() is a completely transistorized servo amplifier which is designed to drive the card of the MN-72() RMI or its equivalent.

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1-2.1.3. (Continued)

1-2. DESCRIPTION OF EQUIPMENT

1-2.1.3.a. RMA-21A RMI Amplifier (Figure 1-3)

The type RMA-21A is designed as an optional subassembly which may be installed in a type NVA-22() Navigation Unit. The RMA-21A is a plug-in module and has separate primary power connections to the NVA-22() rear plug; this allows the RMA-21A to be separately fused from the NVA-22() equipment.

1-2.1.3.b. RMA-21B RMI Amplifier (Figure 3-8)

The type RMA-21B is electrically identical to the RMA-21A but is designed as an independent unit complete with cover, connector, and mounting base. This unit mounts external to the navigation unit, in any convenient location and can be interconnected directly to the RMI. Figure 3-27 is a schematic diagram of the RMA-21B.

1-3. POWER REQUIREMENTS

The "22 Series" Equipment listed in table 1-7 requires the following primary power sources:

- 1) 115 volts, 300-1000 cps (only if a-c power supplies are used).
- 2) 27.5 volts dc.
- 3) 26 volts, 380-420 cps (instrument power).

Total power requirements for any specific system can be determined by adding the power requirements for each component of the system. Table 1-7 lists the maximum power requirements for each unit, for all modes of operation.

TABLE 1-7.

PRIMARY POWER REQUIREMENTS (MAXIMUM), "22 SERIES" EQUIPMENT

PRIMARY POWER SOURCE	USING A-C POWER SUPPLY		USING D-C POWER SUPPLY	26V, 300- 420 CPS INSTRUMENT POWER
	115V, 300-1000 CPS	27.5 VDC	27.5 VDC	
TA-22B VHF TRANSMITTER				
Standby	19.2va 0.96PF	1.1amp	1.1amp	
Transmit	150.0va 0.84PF	1.8amp	8.35amp	
Channeling	19.2va 0.96PF	6.1amp	6.8amp	
RA-22B VHF RECEIVER				
Receive	19.6va 0.85PF	0.18amp	0.9amp	
Disabled	19.6va 0.85PF	0.18amp	0.9amp	
Channeling	19.6va 0.85PF	5.4amp	6.0amp	
NVA-22A NAVI- GATION UNIT				
VOR Receive		.40amp	.40amp	6.5va 0.79PF
ILS Receive		.45amp	.45amp	
RMA-21() RMI AMPLIFIER (If used)		.13amp		
CNA-22() CON- TROL LAMPS		0.24amp		

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INSTALLATION AND OPERATION
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SECTION II. INSTALLATION AND OPERATION

2-1.SYSTEMS INSTALLATION

The "22 Series" equipment may be arranged into three basic systems:

- 1) VHF Communications (only)
- 2) Navigation (only)
- 3) Communications/Navigation (combined)

Each of these systems is covered separately in this section, and each has its own system interconnecting wiring diagram in SECTION III.

The placement of the various units in the aircraft, and the method with which they are mounted, is generally left to the discretion of the installing agency. However, care must be taken to assure that the equipment is not installed for operation in environmental conditions beyond those for which it is designed. Specific environmental limitations for the "22 Series" equipment are given in SECTION I of this manual.

IMPORTANT

Temperature is usually the most critical consideration. In installations where the compartment containing the radio equipment is cooled by forced air through it in flight, provisions should be made for air circulation when the airplane is on the ground. The ambient temperature in the radio compartment should not exceed 55°C for the most reliable service. Forced air cooling data is given on the outline drawing of the units requiring such cooling.

Various shockmounts can be obtained to mount "22 Series" units, either individually or in combinations (see table 1-5). All of these shockmounts have been designed so their rear connectors can be mounted, rotated, and slipped back through the rear mounting plate.

The importance of good grounds in the aircraft cannot be overemphasized. The shockmounts should be grounded by securing the metal straps beneath the feet of the vibration isolators with one of the mounting bolts. Grounds of d-c circuits can generally be returned to any convenient point on the aircraft structure. When a-c primary power is used, care should be exercised to have a common a-c ground wire to the a-c source. Since the a-c ground is returned to the chassis in the "22 Series" equipment, the best practice is to run all the a-c ground wires to a common point near the a-c source. A single short wire should connect this terminal to the airframe. In the case of audio grounds, a similar arrangement should be made. That is, all audio ground leads and shields should be isolated from the airframe and returned to a common terminal. This terminal should be located near the receiver and grounded by a short jumper to the airframe.

In the case of synchros or resolvers from which small signals are obtained, a separate ground wire should normally be run. In the "22 Series" equipment, a separate pin in the rear plug is provided for such grounds.

2-1.A SQUELCH DATA

The RA-22B receiver contains an agc operated squelch circuit that quiets (squelches) the output of the receiver except when an r-f signal above a preset level is being received. This means that there will be no background noise in the receiver output during periods when signals are not being received. The "SENS" control, which can be adjusted through the front panel of the receiver, determines the level of input signal that is required to operate the squelch circuit and return the receiver audio output. With the "SENS" control set fully clockwise, the squelch circuit is set to operate on minimum r-f signal and will allow an audio output. In most installations, there is enough r-f noise to cause the squelch circuit to remain open all the time with the "SENS" control in this position. In this case the "SENS" control should be turned counterclockwise to a setting that just "squelches" the receiver. If the control is set beyond this point, usable receiver sensitivity will be lost. It should be noted that some ground power units produce

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more noise on the ground than is normally experienced in flight. Experience has also shown that there is considerably more r-f noise when flying over certain highly industrialized areas than would normally be experienced. The "SENS" control normally has a range of approximately one to 25 microvolts for squelch operation. The test button on the front panel will disable the squelch circuit when pressed, and the normal background noise, characteristic of a VHF receiver, should be present in the output of an operable receiver.

If desired, a remote squelch disabling switch may be installed; this switch does not parallel the test switch on the front of the receiver but shorts out the "SENS" control, when set to disable the squelch. In most cases, this will cause background noise to appear in the receiver output. However, if the receiver sensitivity is low or if the installation is particularly free of r-f noise, the receiver may still remain squelched. In any case, the receiver is operating at its maximum sensitivity when the remote switch is set to disable the squelch.

A remote squelch control potentiometer may be used in place of the remote switch. The CNA-22Y() Controls incorporate these remote squelch controls. With a remote squelch control the "SENS" control on the front of the receiver is used to set the effective range of the remote squelch control.

2-1.A.1 Super Squelch Option (4RAX-21/22)

The 4RAX-21/22 Super Squelch employs a unique, Bendix developed, squelch-derivation system wherein very narrow squelch bandpass is made possible by converting all frequencies in the receivers pass band (460 ± 20 kc) to a single frequency (636 kc) by multiple mixing. In this type of squelch system random noise tends to cancel, leaving only the carrier in a narrow band amplifier. A second frequency of 634 kc is mixed with the 636-kc carrier to yield a 2-kc signal whose amplitude is representative of signal strength. This signal, after rectification, is applied to a switch circuit which, in turn, performs the squelch operation in the receiver.

The optional 4RAX-21/22 Super Squelch can be obtained as a factory installed unit in the RA-22B VHF Receiver, or it can be obtained as a kit (Bendix Part Number 2065051-0001; installation instructions - 2072937-0001) for retrofit installation in the field.

When the 4RAX-21/22 is incorporated in the receiver, the receiver squelch can still be remotely controlled as explained in paragraph 2-2.A.

2-1.A.1.a. Super Squelch Block Diagram Discussion

Figure 2-1 is a simplified block diagram of the 4RAX-21/22 Super Squelch and the following discussion follows the block diagram.

The i-f output signal (1) from the receiver is coupled to the first mixer (2) and to the second mixer (4) in the 4RAX-21/22. Heterodyning with the 636-kc first oscillator frequency, the i-f carrier frequency (which may be located anywhere in the range from 440 kc to 480 kc) produces a difference frequency between 196 kc and 156 kc. It should be noted that the difference between incoming i-f (1) and the first oscillator (3) frequencies is the output of the first mixer (2); and since the first oscillator is higher in frequency than the i-f input, the first mixer will have an inverted output spectrum. More simply, when the i-f input is lowest in frequency (440 kc), the output frequency of the first mixer will be highest (196 kc) and vice-versa. Subjecting this inverted difference frequency to heterodyning, in the second mixer (4), with the original i-f input frequency, produces an output frequency of 636 kc regardless of the frequency of the applied i-f input.

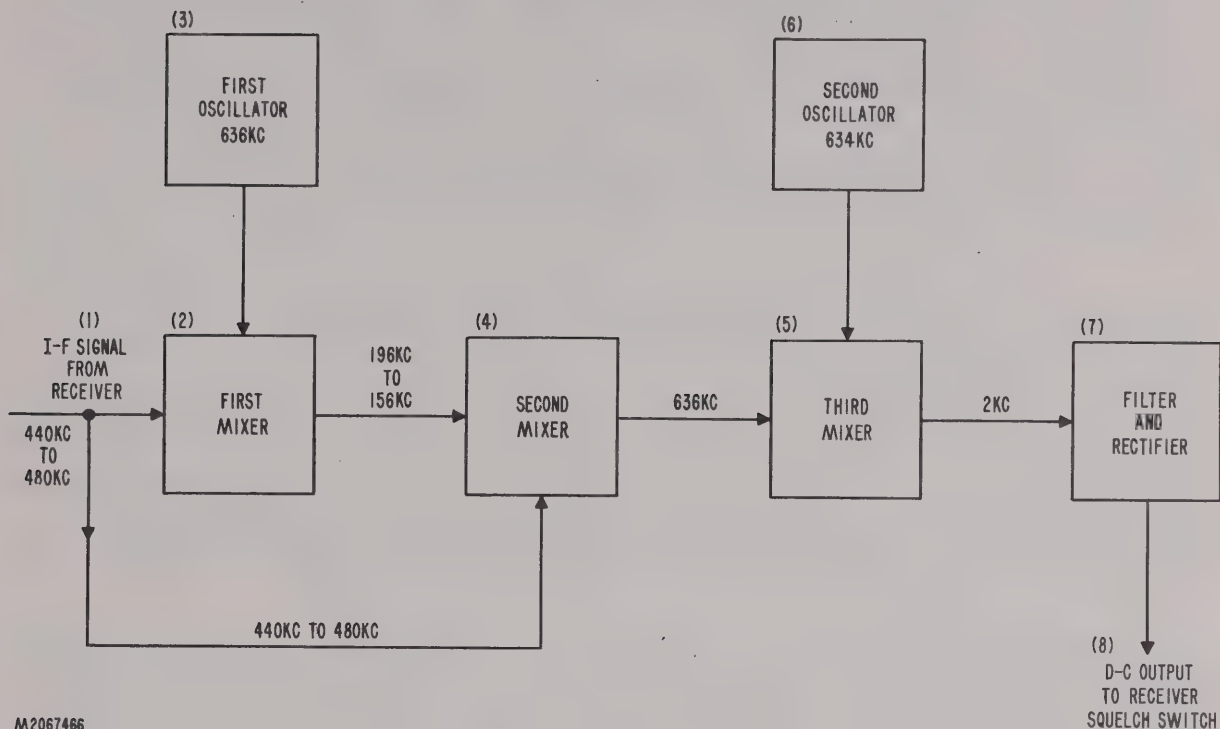
The 636-kc output of the second mixer (4) is combined with the 634-kc output of the second oscillator (6) in the third mixer (5) producing a 2-kc beat-note whenever a carrier is present. This 2-kc signal is filtered (all frequencies except the 2-kc beat-note removed) and rectified (7). The resulting d-c voltage (8) amplitude (representative of carrier strength) is amplified and applied to the receiver's squelch transistor (Q407 in the RA-22B) which acts as a switch.

The switch (Q407) in its quiescent (no signal) state produces a current which, when applied to the receiver's audio section, biases the audio amplifier to cut-off. When the rectified 2 kc, from filter-rectifier (7) reaches the triggering level of the switch, it turns the switch off, thus unsquelching the receiver. Regenerative feedback in the switch circuit ensures positive switching at this level.

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Figure 2-1. Super Squelch, Block Diagram

2-1.B SINGLE CHANNEL (SC) SIMPLEX COMM SYSTEM

Figure 3-17 is an interconnecting wire chart for a simplex (SC) communications system. In this system a single communications antenna is used and is connected, through a type RG-58C/U or RG-141/U coaxial cable, to lower connector P2-A1 on the transmitter (this connector terminal is designated as BA1 on the wire chart). Lower connector P2-A2 (BA2) is then connected, through the same type coaxial cable, to the receiver connector terminal P1-A1. Figure 2-6 is a simplified block and cabling diagram of the above system.

2-1.B.1 Operational Test of Installation

The test procedure given in this section is typical of the tests that might be made prior to a flight to determine if the communications system is operating. The initial tests of an installation should be more comprehensive and should include point-to-point wiring checks as well as a thorough visual inspection for mechanical defects, poor wiring, etc. It is always wise to check that the power circuit leads are not shorted before applying power for the first time.

In the event that proper frequency selection is not accomplished, the continuity check charts in figures 2-2, 2-3, 2-4, and 2-5 can be useful in determining where the trouble is located.

There are two small dials in both the receiver and the transmitter that indicate the frequency to which the units are tuned. The indicated frequencies must match the selected frequencies.

2-1.B.2 Pre-Flight Test Procedure

- (1) Apply power to the system by rotating the "VOL" control on the control unit from its completely counterclockwise position.

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- (2) Allow 30 seconds for the tubes to warm up. Disable the squelch circuit by pressing the test switch on the front of the receiver. Check for noise in the receiver output in the headset or cockpit speaker. Noise should be present when test switch is pressed.
- (3) Select the frequency of the local tower or some station to which a test call may be made. Check that the receiver output is muted during the dialing operation.
- (4) If receiver noise can be obtained by means of a remote squelch switch or control, use it to check for proper operation of the audio VOL control. If no noise can be so obtained, check VOL control operation while listening to local traffic.
- (5) Close the microphone press-to-talk switch and make a test call. Check that the side-tone is clear and that the level is satisfactory. Check for proper receiver operation by noting the level and quality of the response to the test call.

2-1.C NAVIGATION SYSTEM

Figure 3-19 is an interconnecting wire chart for a typical VHF navigation system using "22 Series" equipment; figure 2-7 is a simplified block and cabling diagram. A complete navigation system usually includes an associated glide slope receiver and a marker receiver and these are included in the illustration.

The CNA-22NV VHF Control, has provisions for controlling a DME (distance measuring equipment) designed to operate in accordance with ARINC characteristics 521-B. The same control includes a VOR-CHECK switch which operates a test circuit to quick-check VOR operation.

The MS-192C navigation antenna, which receives the localizer and VOR signals, should be mounted on the airplane so that the dipoles are in a horizontal plane when the aircraft is flying in its normal attitude. It should be located sufficiently far away from the propeller so that the propeller modulation effect on incoming r-f signals is minimized. In installations where this antenna is to feed two separate RA-22B receivers, care must be exercised in the length of the coax cabling. It is recommended that a "T" connector be used in the radio rack area. The length of cable between this connector and the antenna is not critical, however, for best operation, the cable length from the "T" connector to each receiver should be five inches long. If this length of cable is not practical, it may be increased to 37 inches.

For a manual VOR presentation along with localizer and glide slope information, a number of different indicators may be used. If an INA-21A or MN-97 is used, no additional indicator is required unless it is desired to have a second cross-pointer indication for the co-pilot. In this case, an ID-48 would be used to parallel the cross-pointer and flag movements in the primary instrument. The use of two INA-21's or MN-97's in a single navigation system is not recommended, since only one of the units may be used for selecting the VOR bearings. This would mean that, unless the second instrument is set to the same VOR bearing as the primary instrument, a pilot could be misled as to what the VOR bearing actually is. If desired, the INA-21A or MN-97 may be replaced with a combination of the OBS-21 and ID-48 indicators.

The NVA-22A is normally calibrated to feed three 1000-ohm cross-pointer meter movements in parallel and two 1000-ohm flag movements in parallel. If this number of meter movements is not used, equivalent loading resistors must be substituted in place of the movements to maintain the proper cross-pointer and flag movement sensitivities. If additional meter loads are required, five cross-pointer indicators and three flag movements can be operated from an NVA-22A, by removing resistors (R4, R5) from the NVA-22A unit.

There has been little standardization in the resistance of TO-FROM meter movements. The NVA-22A is capable of feeding more than one TO-FROM indicator depending upon the meter resistance. Any amount of TO-FROM current, up to approximately one milliamperere can be obtained by the use of the proper resistance network in the aircraft.

The NVA-22A is designed to work with a resolver in the remote bearing selector, which has been calibrated to EZ (electrical zero) at a bearing of 300 degrees. This differs from the ORZ resolver calibration required by many existing VOR receivers like the Bendix MN-85. A bearing error in the cross-pointer indications of approximately one degree will result, if the NVA-22A is used with a remote omnibearing selector calibrated to ORZ (omni-range zero).

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The OBI (omni-bearing indicator), which is housed in the NVA-22A unit, contains a differential synchro which may be used to drive one or two RMI needles. The differential synchro is, in turn, connected to a transmitting synchro geared to a source which supplies aircraft heading information. The combination of heading information and VOR course radial information makes the RMI needle continually indicate the VOR radial "TO" the station. If the same heading information is also used to drive the RMI card, the needle will indicate the VOR bearing when read against this card. If different heading sources are used to feed the OBI and the RMI card, any difference between the aircraft heading indicated by the two systems will show up as a bearing error on the RMI. If a single heading source is used, the accuracy with which this source is indicating the actual aircraft heading will not affect the accuracy of the RMI bearing, as is the case with an ADF system. It will, however, affect the accuracy of the relative bearing indicated by the RMI needle.

To drive the RMI card, an RMA-21A or -21B RMI servo amplifier is required. The RMA-21A unit is a separate subassembly which is installed in the NVA-22A. The RMA-21B is a separate, complete unit for mounting external to the NVA-22A. Beside the normal synchros associated with an RMI, the MN-72G contains a transmitting synchro which may be used to repeat the bearing indicated by the RMI card to other instruments in the aircraft. Because it contains this transmitting synchro it is referred to as a "bootstrap" RMI.

In some installations, the RMI needles are switched between a VOR and an ADF function. Such switching operation will introduce transients into the synchro system of which these needles are a part. For this reason and to eliminate any bearing errors that might occur due to errors between the RMI card and the master indicator, it is wise to feed the OBI in the NVA-22A from this "bootstrap" synchro (see figure 2-9).

The 26 volts feeding the RMI needle synchro must come from the same source as the 26 volts that powers the transmitting synchro which feeds the OBI.

Figure 2-9 is a simplified diagram which shows pictorially the instrumentation associated with the NVA-22A.

Figure 3-19 gives the complete point-to-point wiring for an entire navigation system. Optional control units and deviation indicators are included in this wiring chart.

2-1.C.1. Operational Test of Installation

The following test procedure will allow the radio mechanic to determine whether the VHF navigation system is operating satisfactorily in the aircraft. It will also allow him to determine which unit is defective in the event that the system is not operating properly.

NOTE

For proper operation of the VHF navigation system, it is necessary that in addition to the 27.5 vdc supply, the primary 400-cycle source in the aircraft be operating.

- (1) Apply power to the RA-22B and NVA-22A by means of the off-on switch on the volume control of the CNA-22().
- (2) Set the frequency selector to a communications channel above 118.0 mc. Check that the receiver is squelched. Press the squelch test button on the front of the receiver and check that background noise appears in the audio output.
- (3) If a VOR ramp test set is available, set the frequency selector to the frequency used by this test set. In the event that a test set is not available, set the frequency selector to the frequency of the local VOR station.

NOTE

Because of the gross-error circuitry in the NVA-22A, the warning flag will appear whenever the OBI is more than five degrees (approx.) from the VOR bearing. While the NVA-22A OBI is rotating to a new VOR bearing, the warning flag will appear. It will remain visible until the OBI reaches the new bearing.

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- (4) The OBI, the dial of which is visible through the front panel of the NVA-22A, should now read the VOR "TO" radial of the test set or the local station.

NOTE

Since the accuracy of this bearing depends upon the type of ramp test set used or the strength of the signal received from the local VOR station, it will be necessary for each user to establish his own limit on the accuracy of the OBI bearing. The NVA-22A itself should not contribute more than three-quarters of a degree error in the system.

- (5) Set the course dial in the remote cross-pointer indicator of omni-bearing selector to the bearing indicated by the OBI. Check that the vertical cross-pointer needle is centered, that the flag is hidden, and that the TO-FROM indicator is indicating "TO". Rotate the bearing dial to a bearing that is 10 degrees higher than that indicated on the OBI. The vertical needle should swing to the left approximately full scale indication.

NOTE

If an expanded range MN-97 is used, the needle will only swing approximately three-quarters of the scale.

- (6) Continue to rotate the bearing selector to a bearing which is 180 degrees from the OBI bearing. Check that the vertical needle centers once again and that the TO-FROM indicator indicates "FROM".
- (7) Check that the RMI dial is repeating the aircraft heading properly.
- (8) Check that the RMI needle connected to the VOR system is repeating the bearing indicated by the OBI. If a local VOR station is used in this test and the aircraft compass system is accurately indicating the aircraft heading, the RMI needle should also be pointing toward the VOR station. If a VOR test set is used, the needle will not necessarily point to the location of the test set.
- (9) With the system receiving VOR signals, as in step (8) above, press VOR-CHECK switch on control panel. RMI pointer should zero on RMI card if no error exists; any deviation from zero is an indication of bearing error. When the VOR-CHECK switch is pressed, the VOR flag must show and remain visible until the VOR-CHECK switch is released and the RMI pointer again rotates to its original VOR indication. A successful VOR-CHECK test indicates an operating NVA-22A and its associated receiver.
- (10) Set the frequency selector to the frequency of the local ILS facility or ILS test set. Check that the warning flag disappears and that the proper cross-pointer indication is obtained. If a glide slope test set is available, check for proper operation of this equipment.
- (11) Set the frequency selector to an ILS frequency on which an ILS signal is not present. Check that both cross pointers center and both warning flags appear. Since the RA-22B squelch is disabled on ILS and VOR frequencies, background noise should be present in the audio output. Using this background noise, check for proper operation of the volume control.

2-1.D COMM/NAV SYSTEM

The TA-22B, RA-22B, and NVA-22A may be combined in a Communications/Navigation system. Such a system is pictured in figure 2-8.

Since the MS-192 NAV Antenna is horizontally polarized and is not designed to receive signals above 118 mc efficiently, it is also necessary to have a VHF communication antenna, designed to operate from

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116.00 mc through 151.95 mc, in a COMM/NAV system. An antenna transfer relay is required to switch between these antennas. This relay is controlled by a voltage from the RA-22B receiver. To prevent the accidental keying of the TA-22B transmitter when a navigation frequency is selected, the microphone control lead is routed through the control box where it is disabled on navigation channels.

Figure 3-18 gives the detailed wiring information for a COMM/NAV system.

2-1.D.1 Operational Test of Installation

The test procedures given for checking a communications system and a navigation system in the aircraft both apply to a communications/navigation system. One additional test that should be made is to check that the transmitter cannot be keyed when the frequency selector is set to a navigation channel.

2-2OPERATION

Standard procedures for the operation of VHF communications and VOR/ILS equipment apply to the "22 Series". In addition, the following may be unique in the "22 Series" equipment.

2-2.A VOR-CHECK

All type CNA-22() Controls that include a "V" in their suffix letters (such as the type CNA-22YSV) include a press-to-test VOR-CHECK switch button on the front panel. When receiving VOR and the operator presses the VOR-CHECK button, a VOR-CHECK circuit in the NVA-22A Navigation Unit is supplied with a ground to initiate an in-flight check on the critical manual circuits. The applied ground enables diode switching which then feeds an inverted 30-cps variable-phase signal through the reference phase channel.

The same type of 30-cps signal is fed to the reference-phase channel and variable-phase channel inputs as if the aircraft is due south of the VOR station. The deviation indicator should center at 000 TO and 180 FROM on the OBS.

When the VOR-CHECK button is pressed, a ground is also connected to the flag alarm circuit in the NVA-22A. The ground to the flag alarm circuit causes the warning flag to show and therefore provides a visual warning that the information presented on the flight instrument is not usable during the VOR-CHECK test period.

2-2.B SQUELCH TEST2-2.B.1. Normal Receiver Squelch

A squelch test pushbutton on the RA-22B front panel permits a quick check of receiver operation by unsquelching the receiver when pressed. If noise comes through when the squelch test button is pressed, the receiver is operating.

All type CNA-22() controls that include a "S" in their suffix letters (such as CNA-22YSV) include a remote SQ (squelch adjust) potentiometer. A screwdriver SENS adjustment through the front panel of the RA-22B receiver permits adjustment of the squelch threshold level. This adjustment must be made while the receiver is in the COMM (communications) mode, and if a remote SQ potentiometer is included in the system, the remote SQ potentiometer must be set fully counterclockwise.

After the SENS potentiometer has been set to the desired squelch threshold level, the remote SQ potentiometer can be used to vary the squelch threshold level to any level (for unsquelching) below the level preset by the SENS adjustment. Turning the remote SQ potentiometer completely clockwise will unsquelch the receiver. This feature may be used to check receiver operation.

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2-2.B. (Continued)

2-2.B.2. 4RAX-21/22 Super Squelch

Receivers that include the 4RAX-21/22 provide reliable and positive action squelch openings from signals down to 0.5 microvolt carrier levels, or below, while remaining impervious to false openings due to noise. This is accomplished by a very narrow bandpass made possible by converting all frequencies in the receiver's pass band into a single frequency by means of multiple mixing. A screwdriver squelch adjust potentiometer R14, located inside the 4RAX-21/22 Super Squelch, sets the desired squelch threshold level. This adjustment is made while the receiver is in the COMM (communications) mode, the SENS potentiometer (R415) fully clockwise, and if a remote SQ (squelch adjust) potentiometer is included in the system, while the remote SQ potentiometer is set fully clockwise. After the squelch adjust potentiometer (R14) has been set to the desired squelch threshold level, adjust the Normal Receiver Squelch as explained in paragraph 2-2.B.1.

When the 4RAX-21/22 is incorporated in the receiver, and an r-f signal above the threshold level preset by the squelch adjustment (R14) is present, the receiver's squelch can be remotely controlled; turning the remote SQ potentiometer completely clockwise will unsquelch the receiver. This feature may be used to check receiver operation.

2-2.C. COMM/NAV TRANSFER SWITCH

Normally the channels from 108.00 megacycles to 117.95 megacycles are used for navigation while the channels from 118.00 megacycles to 151.95 megacycles are used for communications. In areas where it is desired to extend the communications range down to 116.00 megacycles, a COMM/NAV relay in the RA-22B receiver must be operated by applying a ground to pin 3 of P1 of the receiver.

All type CNA-22YSV-1() Controls include a COMM/NAV transfer switch that applies a ground to pin 3 of P1 when the switch is positioned counterclockwise to COMM, T/R, or REC. When the switch is so positioned the system will be in COMM mode for channel selections from 151.95 megacycles down to 116.00 megacycles, and in NAV mode for channel selections from 115.95 megacycles down to 108.00 megacycles. When the COMM/NAV transfer switch is positioned clockwise to NORM or VOR the system will be in COMM mode for channel selections from 151.95 megacycles down to 118.00 megacycles, and in NAV mode from 117.95 megacycles down to 108.00 megacycles.

2-2.D. DME CONTROL

The type CNA-22N() Control includes DME wafer switches and precision resistors to enable selection of DME channels simultaneous with the selection of NAV channels. The control also includes a DME mode switch with standby, normal, and long search positions.

In normal DME operation the mode switch will be set to the normal position. In this position the DME will search from zero to some distance between 25 to 75 nautical miles (usually set at about 50 nautical miles) to inhibit co-channel tracking in congested areas. With the mode switch set to the long search position, maximum range search is provided (about 200 nautical miles). Long search is normally used where maximum range is required because of distances between DME ground facilities.

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ARINC WIRE	A	B	C	D	J	M	WHOLE MC		A	B	C	D	J	M	ARINC WIRE
TA-22B PIN	P2 7	P2 8	P2 9	P2 10	P2 11	P1 17	LO BAND	HI BAND	16	22	23	24	30	31	CNA-22 PIN
	⌋	⌋	⌋	⌋	⌋		116	134	⌋	⌋	⌋	⌋		⌋	
	⌋	⌋	⌋	⌋		⌋	117	135	⌋	⌋	⌋	⌋	⌋		
	⌋		⌋	⌋	⌋		118	136	⌋	⌋	⌋	⌋		⌋	
	⌋		⌋	⌋		⌋	119	137	⌋	⌋	⌋	⌋	⌋		
	⌋	⌋		⌋	⌋		120	138	⌋	⌋	⌋	⌋		⌋	
	⌋	⌋		⌋		⌋	121	139	⌋	⌋	⌋	⌋	⌋		
	⌋	⌋	⌋		⌋		122	140	⌋	⌋	⌋	⌋		⌋	
	⌋	⌋	⌋			⌋	123	141	⌋	⌋	⌋	⌋	⌋		
		⌋	⌋	⌋	⌋		124	142	⌋	⌋	⌋	⌋		⌋	
		⌋	⌋	⌋		⌋	125	143	⌋	⌋	⌋	⌋	⌋		
	⌋	⌋	⌋	⌋	⌋		126	144	⌋	⌋	⌋	⌋		⌋	
	⌋	⌋	⌋	⌋		⌋	127	145	⌋	⌋	⌋	⌋	⌋		
	⌋	⌋	⌋	⌋	⌋		128	146	⌋	⌋	⌋	⌋		⌋	
	⌋	⌋	⌋	⌋		⌋	129	147	⌋	⌋	⌋	⌋	⌋		
	⌋	⌋	⌋	⌋	⌋		130	148	⌋		⌋	⌋	⌋	⌋	
	⌋	⌋	⌋	⌋		⌋	131	149	⌋		⌋	⌋	⌋		
	⌋	⌋	⌋	⌋	⌋		132		⌋	⌋	⌋	⌋		⌋	
	⌋	⌋	⌋	⌋		⌋	133		⌋	⌋	⌋	⌋	⌋		

ARINC WIRE N			
TA-22B PIN →	P1 7	32	← PIN CNA-22
LO BAND	+		
HI BAND		⌋	

NOTE :

- ⌋ DENOTES THIS PIN GROUNDED
- ⌋⌋ PINS CONNECTED TOGETHER, BUT NOT GROUNDED
- ⌋ PIN CONNECTED TO +27.5 V THRU APPROPRIATE RELAY COIL
- ⌋⌋ PINS CONNECTED TOGETHER & CONNECTED TO +27.5 V THRU APPROPRIATE CONTROL RELAY

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Figure 2-2. Whole Megacycle Selection, Continuity Check Chart (TA-22B/CNA-22)

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ARINC WIRE	E	F	G	H	K	L	FRACTIONAL MC		E	F	G	H	K	L	ARINC WIRE
TA-22B PIN	P2 3	P2 4	P2 5	P2 6	P2 12	P2 22	LO BAND	HI BAND	13	17	18	19	20	21	CNA-22 PIN
		+	+	+	+		00	95	///	•	•	•		///	
		+	+	+		+	05	90	///	•	•	•	///		
	+		+	+	+		10	85	•	///	•	•		///	
	+		+	+		+	15	80	•	///	•	•	///		
	•	+	•	+	+		20	75	///	•	///	•		///	
	•	+	•	+		+	25	70	///	•	///	•	///		
	+	•	+	•	+		30	65	•	///	•	///		///	
	+	•	+	•		+	35	60	•	///	•	///	///		
	+	+		+	+		40	55	•	•	///	•		///	
	+	+		+		+	45	50	•	•	///	•	///		
	•	+	+	•	+		50	45	///	•	•	///		///	
	•	+	+	•		+	55	40	///	•	•	///	///		
	•	•	+	+	+		60	35	///	///	•	•		///	
	•	•	+	+		+	65	30	///	///	•	•	///		
	+	•	•	•	+	+	70	25	•	///	///	•		///	
	+	•	•	•	+	+	75	20	•	///	///	•	///		
	+	+	•	•	+		80	15	•	•	///	///		///	
	+	+	•	•		+	85	10	•	•	///	///	///		
	+	+	+			+	90	05	•	•	•	///		///	
	+	+	+			+	95	00	•	•	•	///	///		

NOTES:

- /// DENOTES THIS PIN GROUNDED.
 ••• PINS CONNECTED TOGETHER, BUT NOT GROUNDED.
 +++ PINS CONNECTED TOGETHER & CONNECTED TO +27.5V THRU APPROPRIATE RELAY.

W2067021A

Figure 2-3. Fractional Megacycle Selection, Continuity Check Chart (TA-22B/CNA-22)

Bendix Avionics Division

Publication Number
I. B. 1022

SECTION II
INSTALLATION AND OPERATION
"22 SERIES" COMM/NAV SYSTEMS

ARINC WIRE RA-22B PIN	A	B	C	D	J	M	WHOLE MC		A	B	C	D	J	M	ARINC WIRE CNA-22 PIN
	6	7	8	9	14	17	LO BAND	HI BAND	1	2	7	8	14	15	
	⬤	+	⬤	+	+		108	136	⌞	⬤	⌞	⬤		⌞	
	⬤	+	⬤	+		+	109	137	⌞	⬤	⌞	⬤	⌞		
	⬤	⬤	+	⬤	+		110	138	⌞	⌞		⌞		⌞	
	⬤	⬤	+	⬤		+	111	139	⌞	⌞		⌞	⌞		
	⬤	⬤	⬤	+	+		112	148	⌞	⌞	⌞			⌞	
	⬤	⬤	⬤	+		+	113	149	⌞	⌞	⌞		⌞		
	+	⬤	⬤	⬤	⬤	+	114	150		⌞	⌞	⌞		⌞	
	+	⬤	⬤	⬤		+	115	151		⌞	⌞	⌞	⌞		
	+	+	⬤	⬤	⬤	+	116	142	⬤	⬤	⌞	⌞		⌞	
	+	+	⬤	⬤		+	117	143	⬤	⬤	⌞	⌞	⌞		
	⬤	+	+	⬤	⬤	+	118	144	⌞	⬤	⬤	⌞		⌞	
	⬤	+	+	⬤		+	119	145	⌞	⬤	⬤	⌞	⌞		
	+		+	+	+	+	120		⬤	⌞	⬤	⬤		⌞	
	+		+	+		+	121		⬤	⌞	⬤	⬤	⌞		
	+	+		+	+		122		⬤	⬤	⌞	⬤		⌞	
	+	+		+		+	123		⬤	⬤	⌞	⬤	⌞		
	+	+	+		+		124		⬤	⬤	⬤	⌞		⌞	
	+	+	+			+	125		⬤	⬤	⬤	⌞	⌞		
		+	+	+	+	+	126		⌞	⬤	⬤	⬤		⌞	
		+	+	+		+	127		⌞	⬤	⬤	⬤	⌞		
	⬤	⬤	+	+	+	+	128	146	⌞	⌞	⬤	⬤		⌞	
	⬤	⬤	+	+		+	129	147	⌞	⌞	⬤	⬤	⌞		
	+	⬤	⬤	+	+	+	130	140	⬤	⌞	⌞	⬤		⌞	
	+	⬤	⬤	+		+	131	141	⬤	⌞	⌞	⬤	⌞		
	⬤	+	⬤	⬤	⬤	+	132		⌞		⌞	⌞		⌞	
	⬤	+	⬤	⬤		+	133		⌞		⌞	⌞	⌞		
	+	⬤	+	⬤	+	+	134		⬤	⌞	⬤	⌞		⌞	
	+	⬤	+	⬤		+	135		⬤	⌞	⬤	⌞	⌞		

ARINC WIRE N			
RA-22B PIN	20	9	CNA-22 PIN
LO BAND	⌞	⌞	
HI BAND	+		

NOTE:

⌞ DENOTES THIS PIN GROUNDED.

⬤⬤ PINS CONNECTED TOGETHER, BUT NOT GROUNDED.

⊕ PIN CONNECTED TO +27.5V THRU APPROPRIATE RELAY.

⊕⊕ PINS CONNECTED TOGETHER & CONNECTED TO +27.5V THRU APPROPRIATE RELAY.

M20670038

Figure 2-4. Whole Megacycle Selection, Continuity Check Chart (RA-22B/CNA-22)

SECTION II
 INSTALLATION AND OPERATION
 "22 SERIES" COMM/NAV SYSTEMS

ARINC WIRE RA-22B PIN	E	F	G	H	K	L	FRACT MC	E	F	G	H	K	L	ARINC WIRE CNA-22 PIN
		+	+	+	+		00	m	•	•	•		m	
		+	+	+		+	05	m	•	•	•	m		
	+		+	+	+		10	•	m	•	•		m	
	+		+	+		+	15	•	m	•	•	m		
•	+	•	+	+	+		20	m	•	m	•		m	
•	+	•	+		+	+	25	m	•	m	•	m		
+	•	+	•	•	+	+	30	•	m	•	m		m	
+	•	+	•	•		+	35	•	m	•	m	m		
+	+		+	+	+		40	•	•	m	•		m	
+	+		+		+	+	45	•	•	m	•	m		
•	+	+	•	•	+	+	50	m	•	•	m		m	
•	+	+	•	•		+	55	m	•	•	m	m		
•	•	+	+	+	+		60	m	m	•	•		m	
•	•	+	+	+		+	65	m	m	•	•	m		
+	•	•	•	+	+	+	70	•	m	m	•		m	
+	•	•	•	+		+	75	•	m	m	•	m		
+	+	•	•	•	+	+	80	•	•	m	m		m	
+	+	•	•	•		+	85	•	•	m	m	m		
+	+	+	•		+		90	•	•	•	m		m	
+	+	+	•			+	95	•	•	•	m	m		

NOTE:

- m DENOTES THIS PIN GROUNDED.
- PINS CONNECTED TOGETHER, BUT NOT GROUNDED.
- ++ PINS CONNECTED TOGETHER & CONNECTED TO +27.5 V THRU APPROPRIATE CONTROL RELAY.

M2067004A

Figure 2-5. Fractional Megacycle Selection, Continuity Check Chart (RA-22B/CNA-22)

SECTION II
 INSTALLATION AND OPERATION
 "22 SERIES" COMM/NAV SYSTEMS

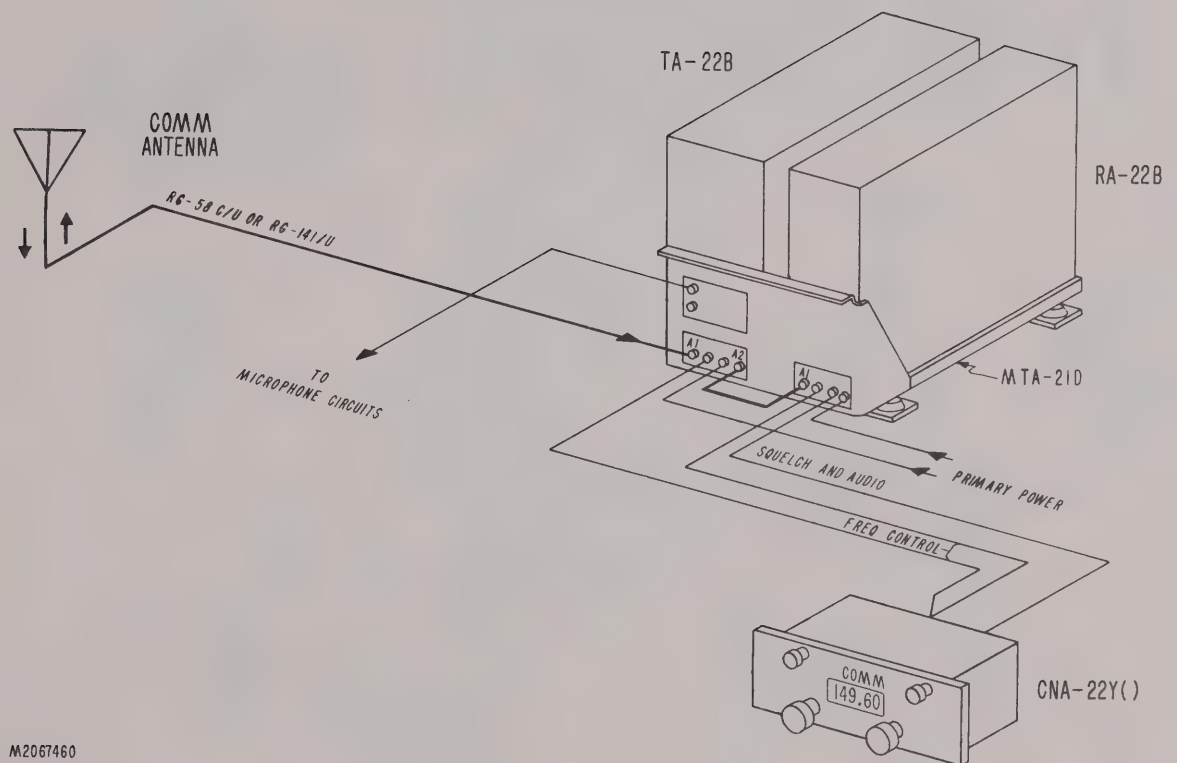


Figure 2-6. Single VHF COMM System, Simplified Cabling Diagram

SECTION II
 INSTALLATION AND OPERATION
 "22 SERIES" COMM/NAV SYSTEMS

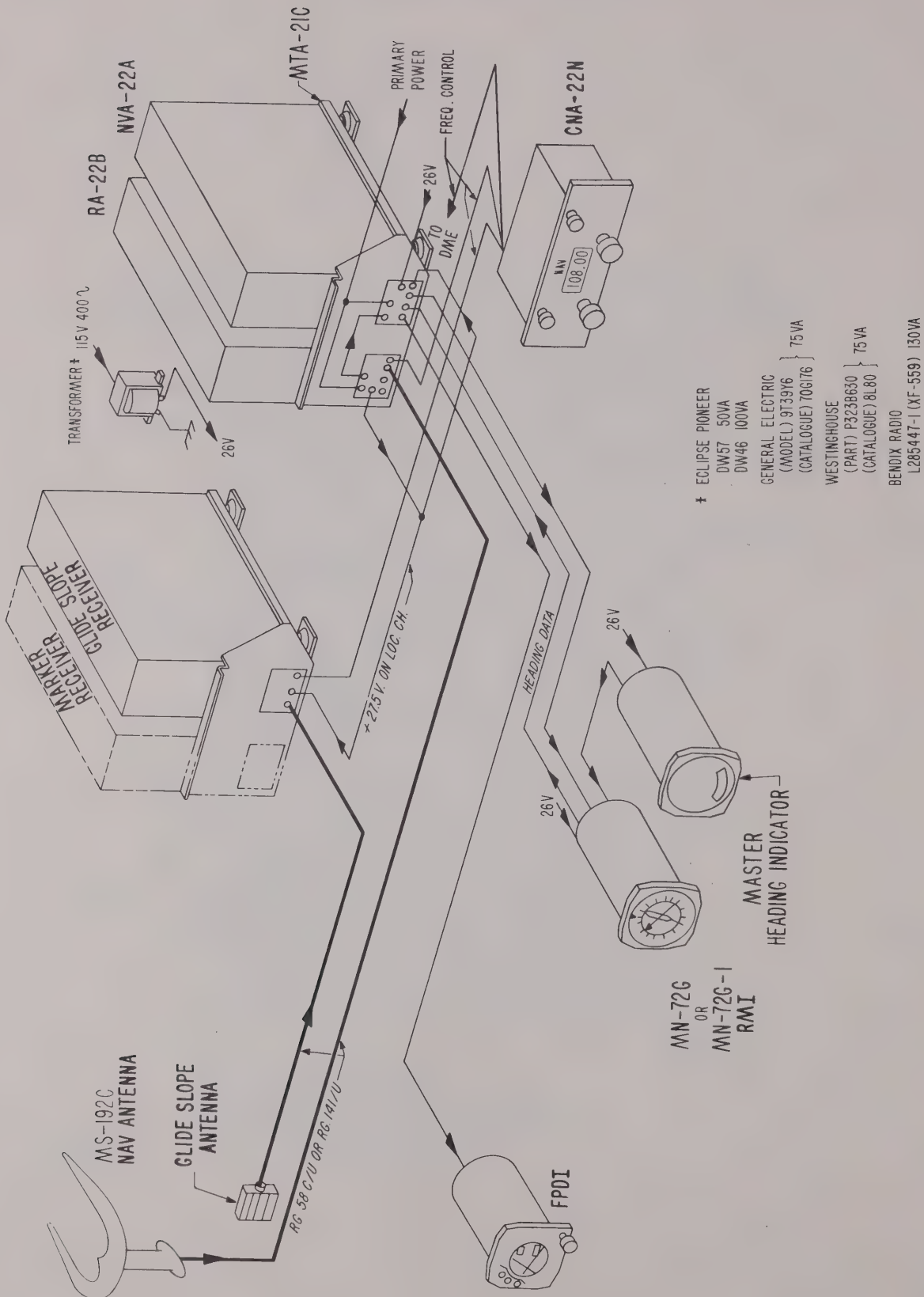


Figure 2-7. Single VHF NAV System, Simplified Cabling Diagram

2-15

SECTION II
 INSTALLATION AND OPERATION
 "22 SERIES" COMM/NAV SYSTEMS

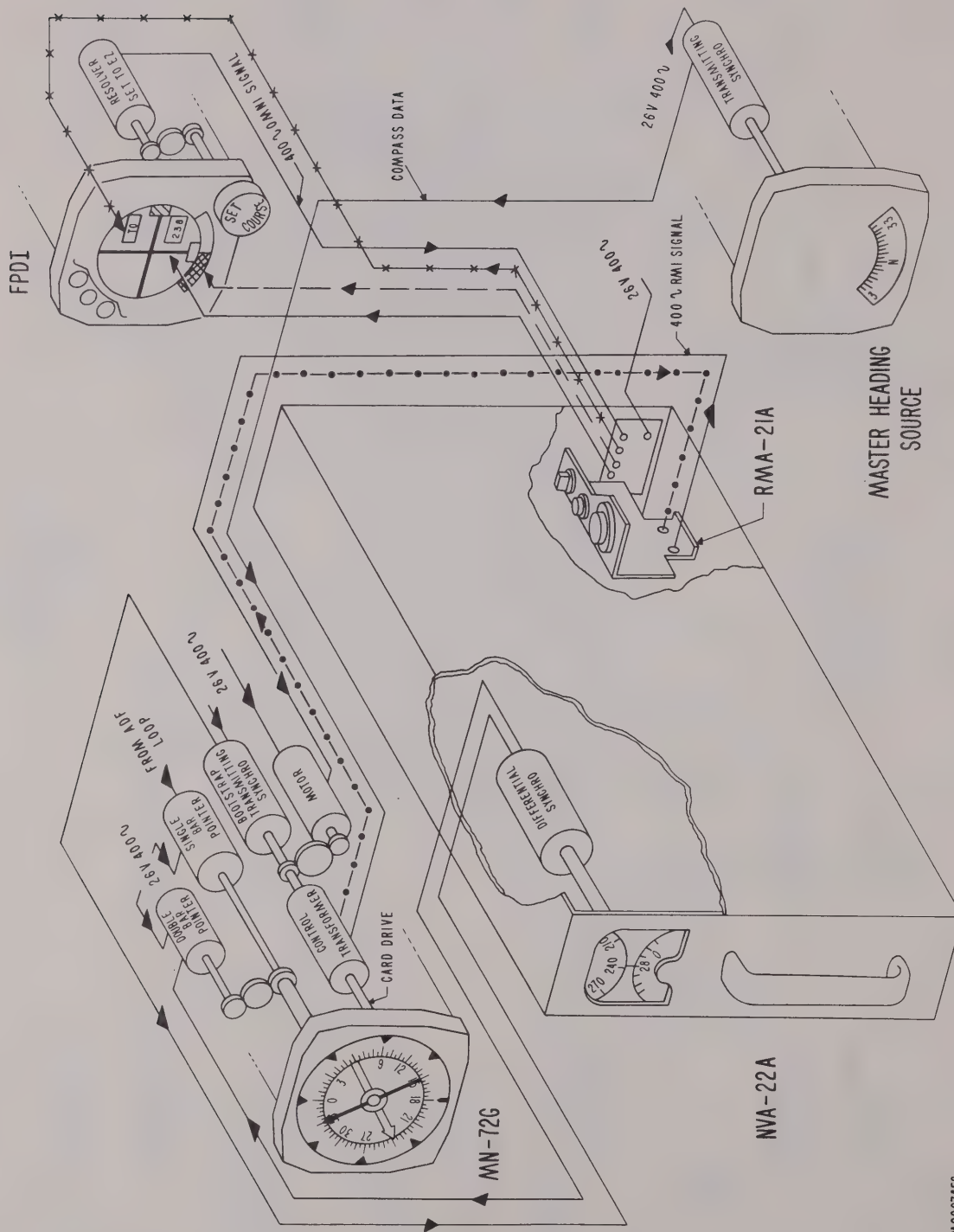


Figure 2-9. Simplified VOR Instrumentation Diagram

SECTION III
ILLUSTRATIONS
"22 SERIES" COMM/NAV SYSTEMS

SECTION III. ILLUSTRATIONS

SECTION III

ILLUSTRATIONS

"22 SERIES" COMM/NAV SYSTEMS

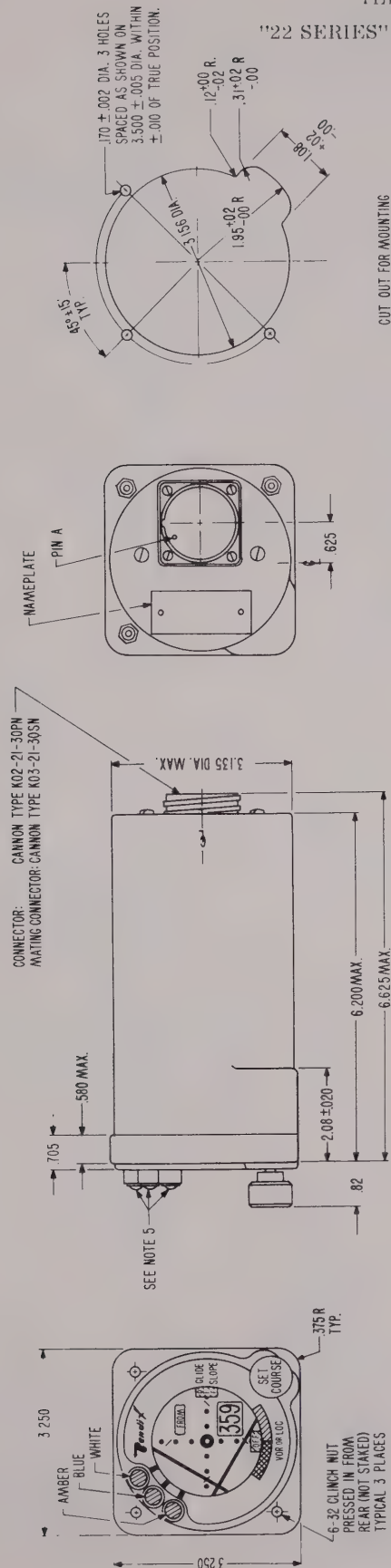


Figure 3-1. INA-21() Indicator, Outline Drawing

CUT OUT FOR MOUNTING
FROM REAR OF PANEL

FINISH	TS.O.
NUMERALS, DOTS, POINTERS, "TO" "FROM"	GLIDE SLOPE
COLOR MUNSSELL 5.0B 3/2	C-34, CAT-B
COLOR MUNSSELL 5.0B 3/2	C-36, CAT-B
MATTE WHITE	C-40, CAT-B

BENDIX PART NO.	BENDIX TYPE NO.	REMARKS	GLIDE SLOPE	LOC.	VOR	WEIGHT	NAMEPLATE DRAWING NO.	SCHEMATIC DRAWING NO.
N2087059-1	INA-21A	EZ/0RZ	C-34, CAT-B	C-36, CAT-B	C-40, CAT-B	1.9 LBS.	C2082109-1	N2087059 SH 2
N2087059-2	INA-21A-1	EZ/0RZ	C-34, CAT-B	C-36, CAT-B	C-40, CAT-B	1.9 LBS.	C2082109-2	N2087059 SH 2

NOTES

- 1- EACH MARKER LIGHT IS EQUIPPED WITH A MECHANICAL DIMMER.
- 2- COLOR IDENTIFICATION FOR EACH LAMP IS SHOWN ON FRONT MASK OF UNIT
- 3- COLOR 65 IS US RADIUM NO. 65. MEETS SPEC MIL 25142 - YELLOW
- 4- THIS DRAWING IS NOT COMPLETE WITHOUT A COPY OF THE LATEST ISSUE OF BP-997 AND PARTS LIST (2086290).

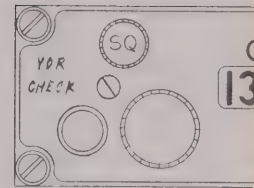
TOLERANCES UNLESS OTHERWISE SPECIFIED
2 PLACE DEC. 3 PLACE DEC.
±.02 ±.010

CUT OUT FOR MOUNTING
FROM FRONT OF PANEL

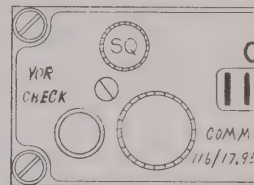
2087059

SECTION III
ILLUSTRATIONS
BENDIX "22 Series" COMM/NAV SYSTEMS

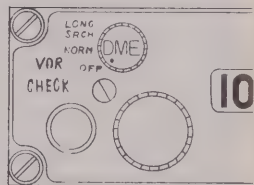
BASIC TYPE	BENDIX RADIO TYPE NUMBER	BENDIX RADIO PART NUMBER	FUNCTION	MAX FREQ 117.95MC	LIMIT STOP		SQUELCH	VOR-CHECK	ADF	SCHEMATIC DRAWING NO.
					118.00MC	116.00MC				
CNA-22A() COMMUNICATION AND/OR NAVIGATION UNIT CONTAINING ALL V.H.F. RECEIVER, V.H.F. TRANSMITTER AND GLIDE SLOPE SWITCH WAFERS, VOL- UME CONTROL INCLUDED, FREQUENCY RANGE 108.00 - 135.95 MC CONNECTOR: CANNON TYPE KO2-21L-50PN MATING CONNECTOR: KOAG-21-50SN	CNA-22A	2087327-2201	NAV/COMM	YES						2087504
	CNA-22AN	2087327-2202	NAV	YES						2087504
	CNA-22AC	2087327-2203	COMM		YES					2087504
	CNA-22ACS	2087327-2204	COMM		YES		YES			2087504
	CNA-22AS	2087327-2205	NAV/COMM				YES			2087504
	CNA-22ASV	2087327-2206	NAV/COMM				YES	YES		2087504
	CNA-22ANV	2087327-2207	NAV	YES				YES		2087504
	CNA-22AV	2087327-2208	NAV/COMM					YES		2087504
CNA-22N() NAVIGATION UNIT CONTAINING ALL V.H.F. RECEIVER, GLIDE SLOPE AND DME WAFER SWITCH- ES WITH DME SWITCHES AND PRE- CISION RESISTORS, VOLUME CON- TROL INCLUDED, FREQUENCY RANGE 108.00 - 117.95 MC CONNECTOR: CANNON TYPE KO2-21L-50PX MATING CONNECTOR: CANNON TYPE KOAG-21-50SX	CNA-22N	2087327-2209	NAV	YES						2087500
	CNA-22NV	2087327-2210	NAV	YES				YES		2087500
CNA-22Y() COMMUNICATION AND/OR NAVIGATION UNIT CONTAINING ALL V.H.F. RECEIVER, V.H.F. TRANSMITTER AND GLIDE SLOPE SWITCH WAFERS, VOL- UME CONTROL INCLUDED, FREQUENCY RANGE 108.00 - 149.95 MC CONNECTOR: CANNON TYPE KO2-21L-50PN MATING CONNECTOR: CANNON TYPE KOAG-21-50SN	CNA-22YCS	2087327-2217	COMM			YES	YES			2087681
	CNA-22YSV	2087327-2218	NAV/COMM					YES		2087681



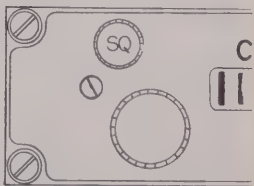
AS SHOWN: -2219, -2220
WITHOUT ADF -2206
WITHOUT ADF, VOR CHECK AND



AS SHOWN: -2218
WITHOUT COMM/NORM AND V
WITHOUT COMM/NORM AND SQ



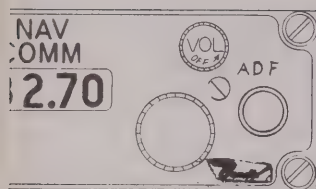
AS SHOWN 2210
WITHOUT VOR CHECK 2209
WITHOUT DME 2209, WITHOUT



AS SHOWN: -2204, -2217
WITHOUT SQ: -2203

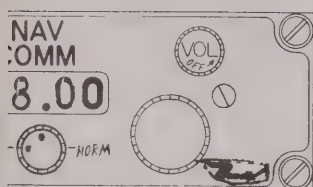
2087327K

Figure 3-2. CNA-22() Control, Except CNA-22YSV-(), Outline Drawing



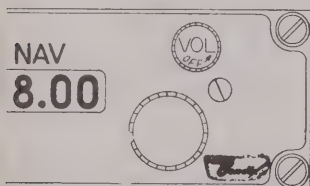
107327 -

SQ: -2201



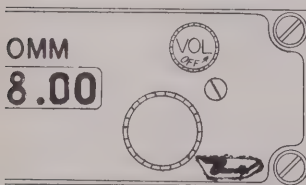
087327 -

OR CHECK: -2205
: -2208

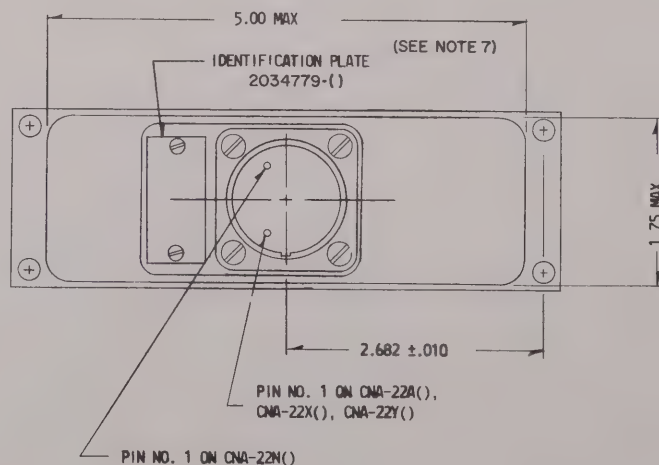
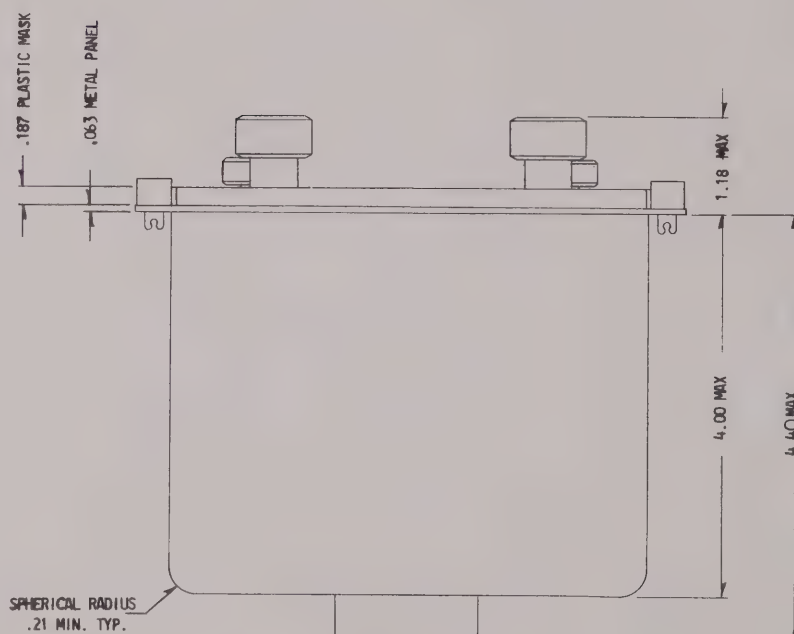
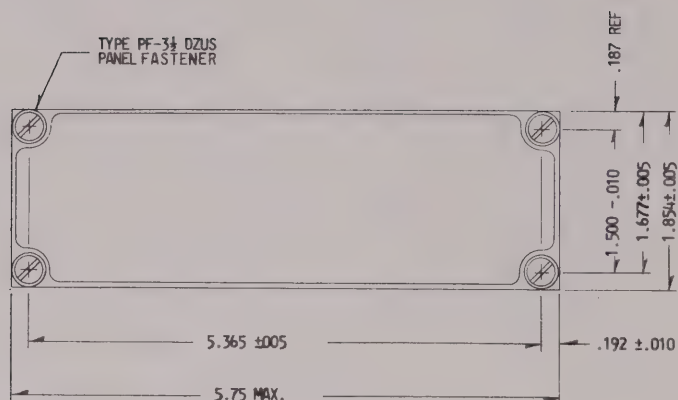


107327 -

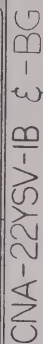
VOR CHECK AND DME: -2202



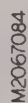
97327 -



BENDIX "22 Series" COMM/NAV SYSTEMS



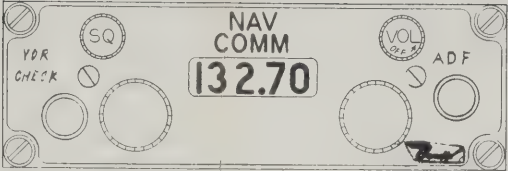
1. The Volume Control has an "A" taper and a resistance of 2,500 ohms $\pm 10\%$.
2. The Squelch Control has a "B" taper and a resistance of 10,000 ohms $\pm 20\%$.
3. Integral lighting in accordance with MIL-P-007783B.



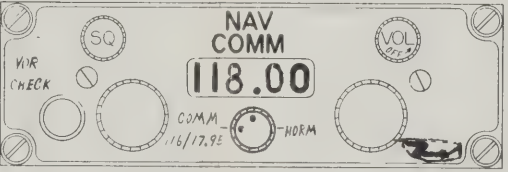
3-7

SECTION III
ILLUSTRATIONS
BENDIX "22 Series" COMM/NAV SYSTEMS

BASIC TYPE	BENDIX RADIO TYPE NUMBER	BENDIX RADIO PART NUMBER	FUNCTION	LIMIT STOP		SQUELCH	VOR-CHECK	ADF	SCHEMATIC DRAWING NO.
				MAX FREQ 117.95MC	MIN. FREQ. 116.00MC				
CNA-22A() COMMUNICATION AND/OR NAVIGATION UNIT CONTAINING ALL V. H. F. RECEIVER, V. H. F. TRANSMITTER AND GLIDE SLOPE SWITCH WAFERS. VOL- UME CONTROL INCLUDED. FREQUENCY RANGE 108.00 - 135.95 MC. CONNECTOR: CANNON TYPE KOA2-21L-50PN MATING CONNECTOR: CANNON TYPE KOAG-21-50SN	CNA-22A	2087327-2201	NAV/COMM						2087504
	CNA-22AN	2087327-2202	NAV	YES					2087504
	CNA-22AC	2087327-2203	COMM		YES				2087504
	CNA-22ACS	2087327-2204	COMM		YES	YES			2087504
	CNA-22AS	2087327-2205	NAV/COMM			YES			2087504
	CNA-22ASV	2087327-2206	NAV/COMM			YES	YES		2087504
	CNA-22ANV	2087327-2207	NAV	YES			YES		2087504
	CNA-22AV	2087327-2208	NAV/COMM				YES	YES	2087504
CNA-22N() NAVIGATION UNIT CONTAINING ALL V. H. F. RECEIVER, GLIDE SLOPE AND DME WAFER SWITCH- ES WITH DME SWITCHES AND PRE- CISION RESISTORS. VOLUME CON- TROL INCLUDED. FREQUENCY RANGE 108.00 - 117.95 MC. CONNECTOR: CANNON TYPE KOAG-21-50PX MATING CONNECTOR: CANNON TYPE KOAG-21-50SX	CNA-22N	2087327-2209	NAV	YES					2087500
	CNA-22NV	2087327-2210	NAV	YES			YES		2087500
CNA-22Y() COMMUNICATION AND/OR NAVIGATION UNIT CONTAINING ALL V. H. F. RECEIVER, V. H. F. TRANSMITTER AND GLIDE SLOPE SWITCH WAFERS. VOL- UME CONTROL INCLUDED. FREQUENCY RANGE 108.00 - 149.95 MC CONNECTOR: CANNON TYPE KOAG-21L-50PN MATING CONNECTOR: CANNON TYPE KOAG-21-50SN	CNA-22YCS	2087327-2217	COMM			YES			2087681
	CNA-22YSV	2087327-2218	NAV/COMM				YES	YES	2087681



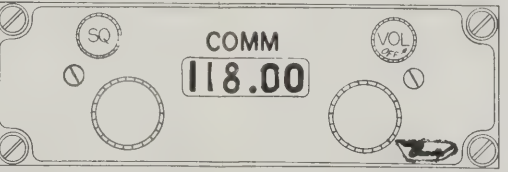
2087327 -
AS SHOWN - 2219, -2220
WITHOUT ADF - 2206
WITHOUT ADF, VOR CHECK AND SQ - 2201



2087327 -
AS SHOWN - 2218
WITHOUT COMM/NORM AND VOR CHECK - 2205
WITHOUT COMM/NORM AND SQ - 2208



2087327 -
AS SHOWN 2210
WITHOUT VOR CHECK - 2209
WITHOUT DME - 2201, WITHOUT VOR CHECK AND DME - 2202



2087327 -
AS SHOWN - 2204, -2217
WITHOUT SQ - 2203

2087327K

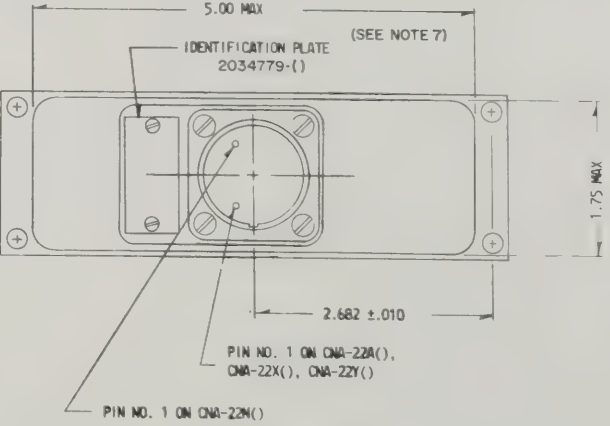
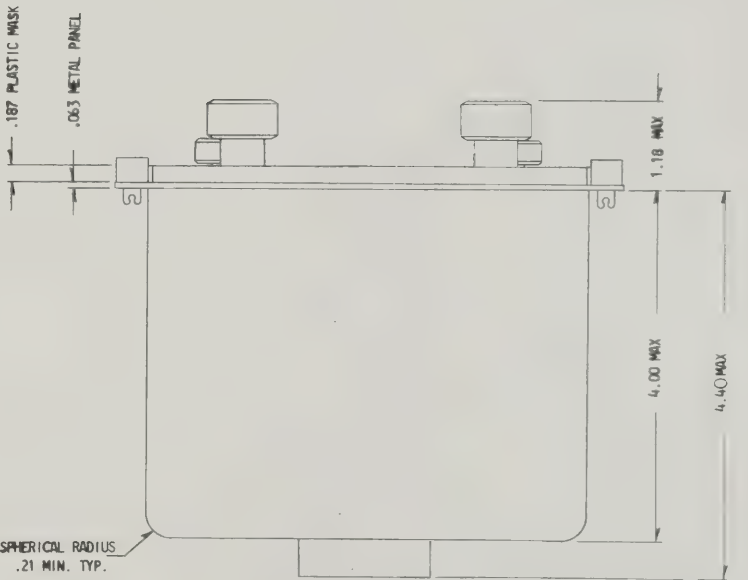
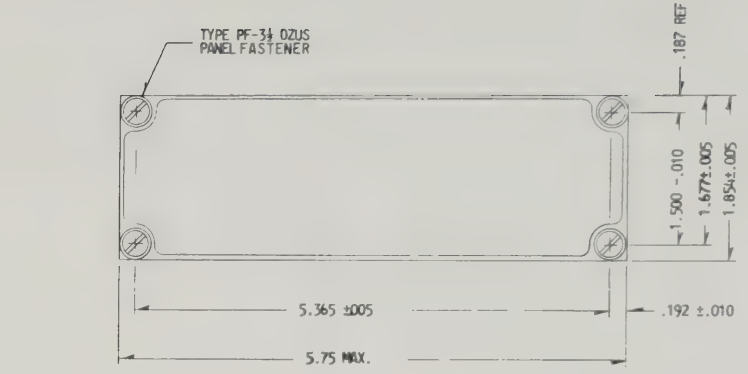
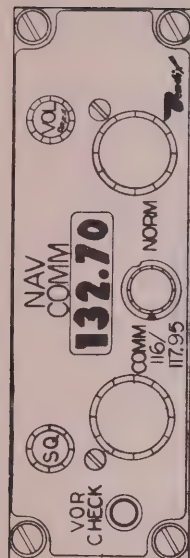


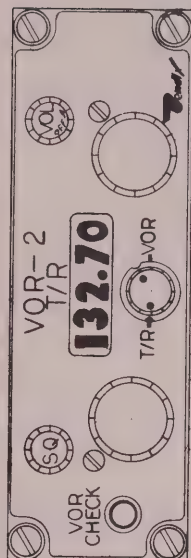
Figure 3-2. CNA-22() Control, Except CNA-22YSV-(), Outline Drawing

SECTION III
ILLUSTRATIONS
BENDIX "22 Series" COMM/NAV SYSTEMS

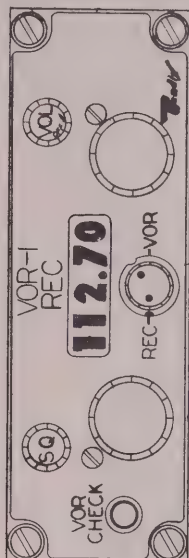


CNA-22YSV-I

M2087924



CNA-22YSV-IA ξ-AG



CNA-22YSV-IB ξ-BG

DESCRIPTION	TYPE NO.	PART NO.	WEIGHT	SCHEMATIC DWG. NO.	APPLICABLE NOTES
Communication and navigation control unit containing all V.H.F. Receiver, V.H.F. Transmitter, and Glide Slope switch wafers, volume control, squelch control, and VOR-CHECK switch included. Frequency range: 108.00-131.95 mc.	GNA-22YSV-1	2087924-0001	1.6 LBS.	2087681	1, 2, and 3
	CNA-22YSV-1A	2087084-0001	1.6 LBS.	2087681	1, 2, and 3
	CNA-22YSV-1AG	2087084-0003	1.6 LBS.	2087681	1, 2, and 3
	CNA-22YSV-1B	2087084-0002	1.6 LBS.	2087681	1, 2, and 3
	CNA-22YSV-1BG	2087084-0004	1.6 LBS.	2087681	1, 2, and 3

NOTES:

1. The Volume Control has an "A" taper and a resistance of 2,500 ohms $\pm 10\%$.
2. The Squelch Control has a "B" taper and a resistance of 10,000 ohms $\pm 20\%$.
3. Integral lighting in accordance with MIL-P-00768B.

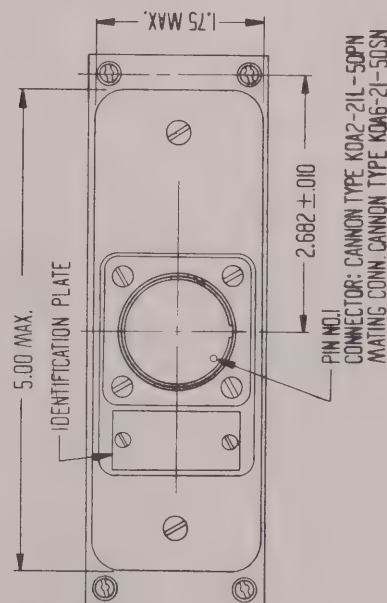
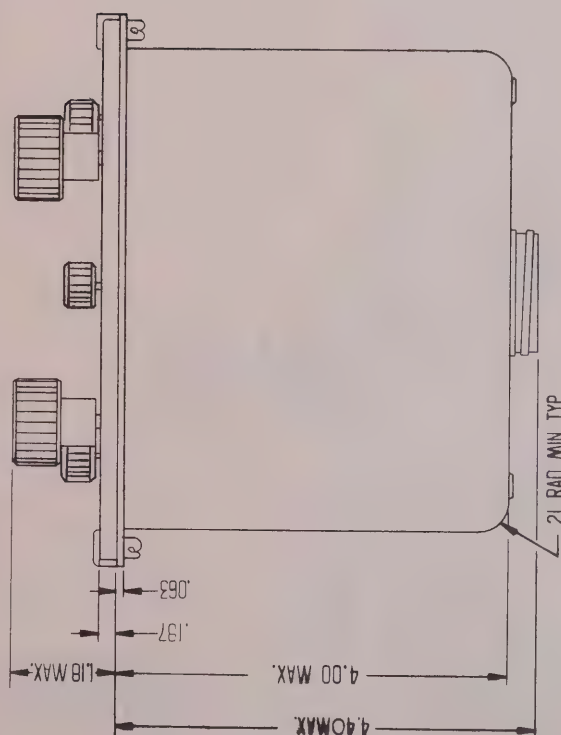
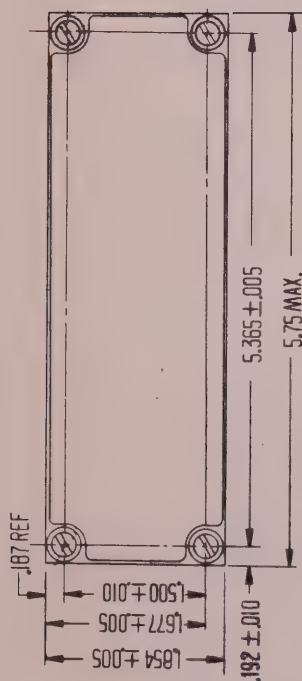
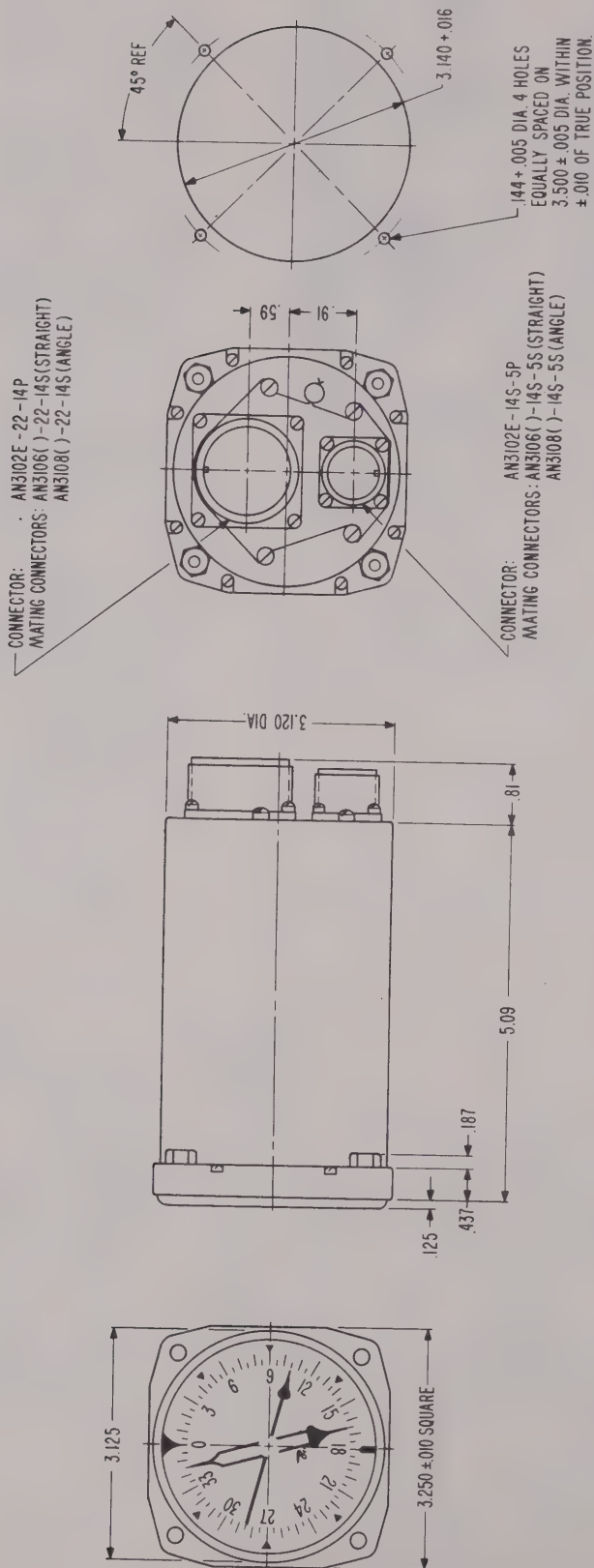


Figure 3-3. CNA-YSV-() Control, Outline Drawing

M2067084

SECTION III
ILLUSTRATIONS

"22 SERIES" COMM/NAV SYSTEMS



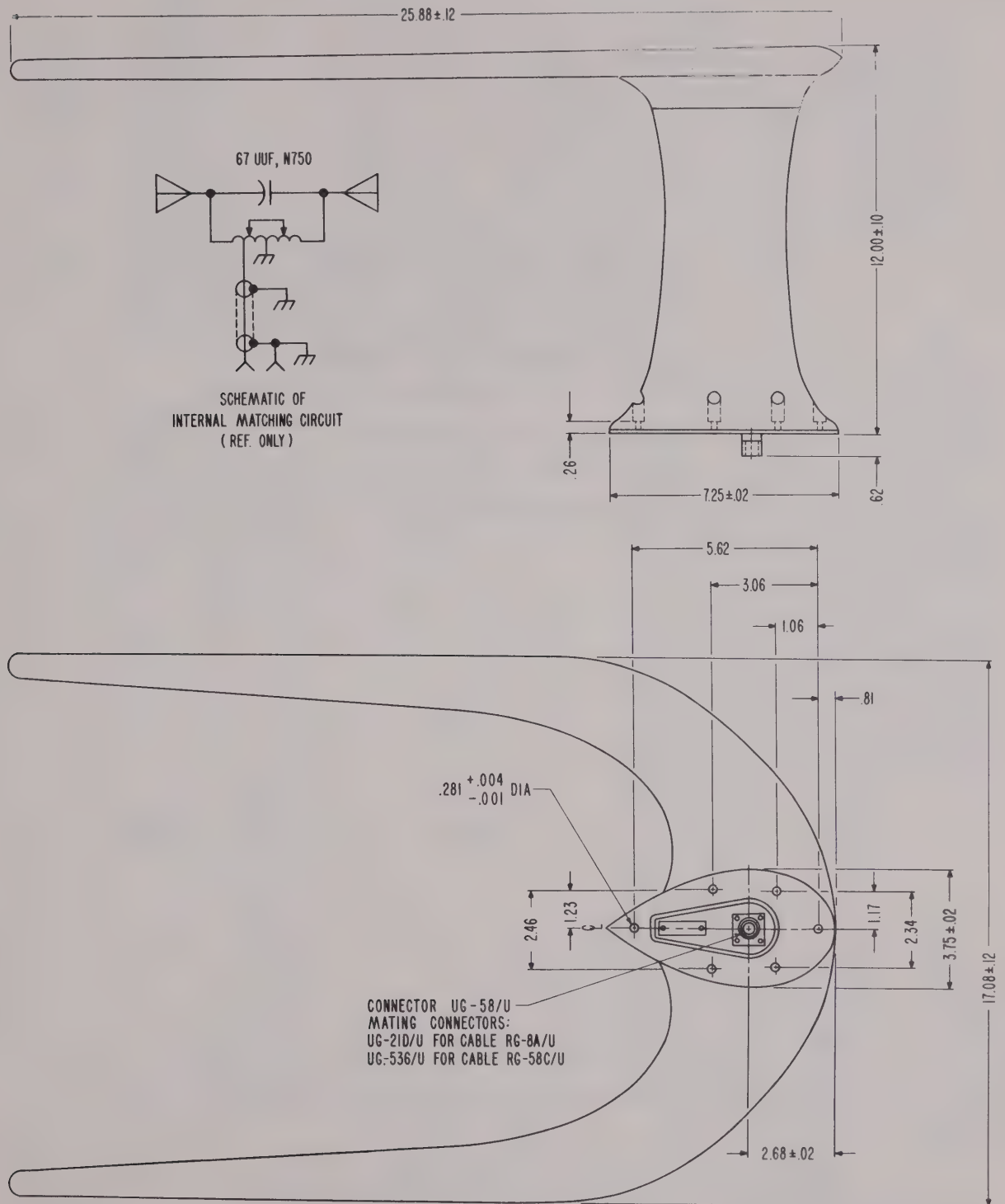
BENDIX RADIO TYPE NO	ECLIPSE-PIONEER TYPE NO.	TSO APPROVAL	FINISH NUMERALS & POINTERS	BACKGROUND	WEIGHT
MN-72G	3605-K-16-C1	C-6b	AN-1-1	DULL BLACK	2.5 LBS.
MN-72G-1	3605-15-14-C1	C-6b	MATTE WHITE	DULL BLACK	2.5 LBS.

TOLERANCES UNLESS OTHERWISE SPECIFIED	
2 PLACE DEC.	3 PLACE DEC.
± .03	± .005

N2087053

Figure 3-4. MN-72G Radio Magnetic Indicator, Outline Drawing

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TOLERANCES UNLESS OTHERWISE SPECIFIED	
2 PLACE DEC.	3 PLACE DEC.
±.01	—

FREQUENCY IN MC	VSWR	IMPEDANCE	WEIGHT (POUNDS)
108-121.9	5:1 MAX	50 OHMS	5.75

Figure 3-5. MS-192C NAV Antenna (108-121.9mc), Outline Drawing

SECTION III
ILLUSTRATIONS
"22 SERIES" COMM/NAV SYSTEMS

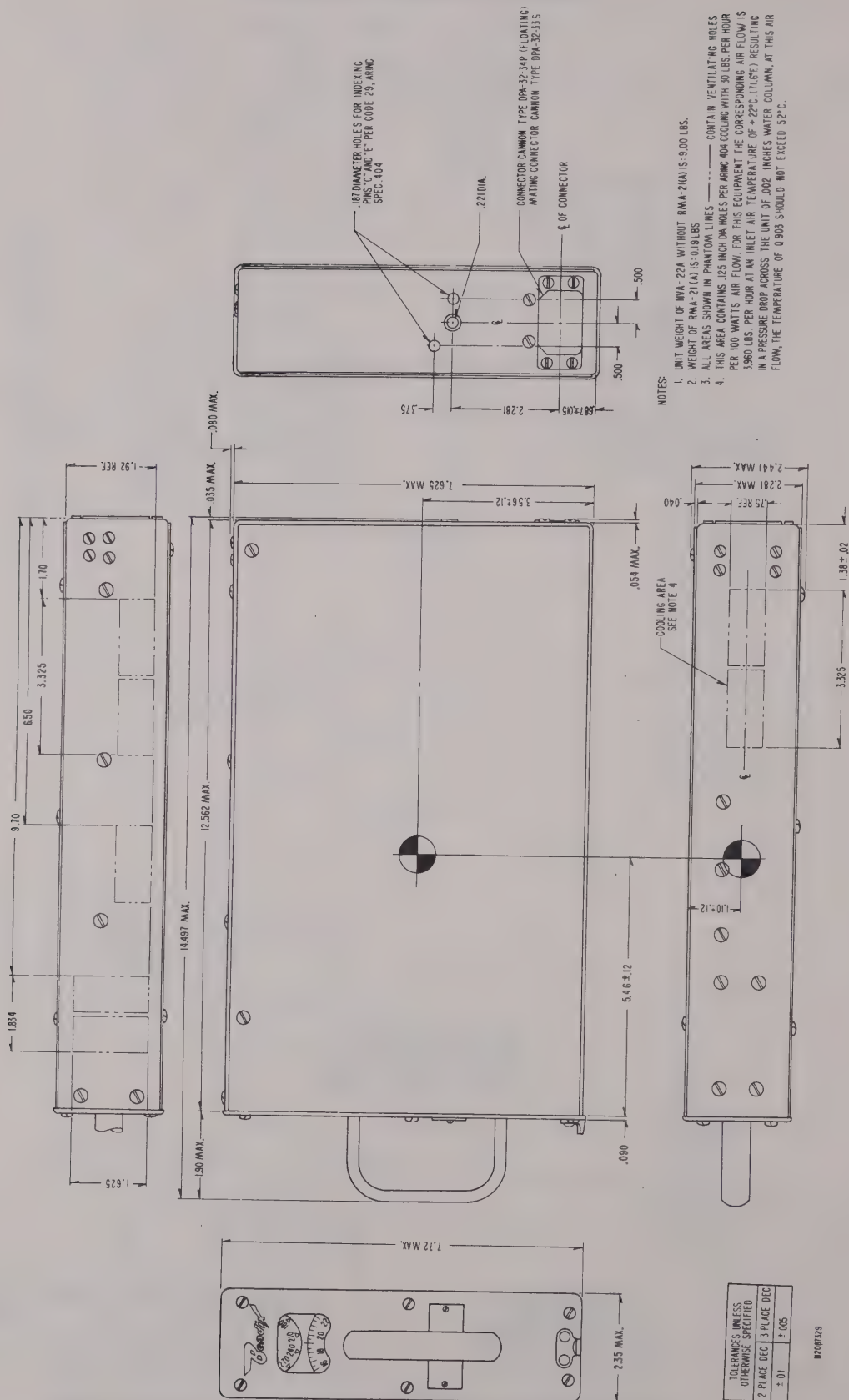


Figure 3-6. NVA-22() VHF Navigation Unit, Outline Drawing

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"22 SERIES" COMM/NAV SYSTEMS

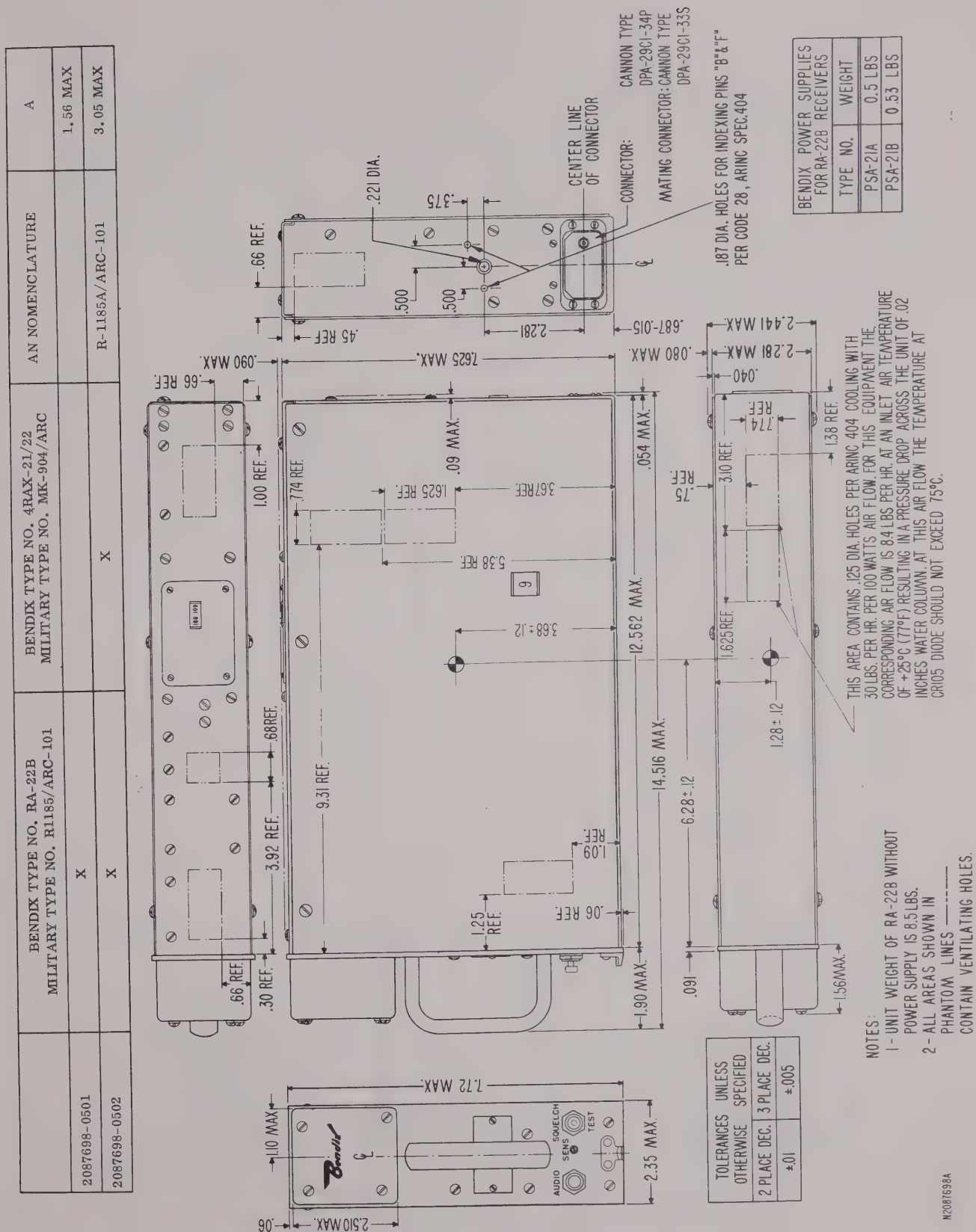


Figure 3-7. RA-22() VHF Receiver, Outline Drawing

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"22 SERIES" COMM/NAV SYSTEMS

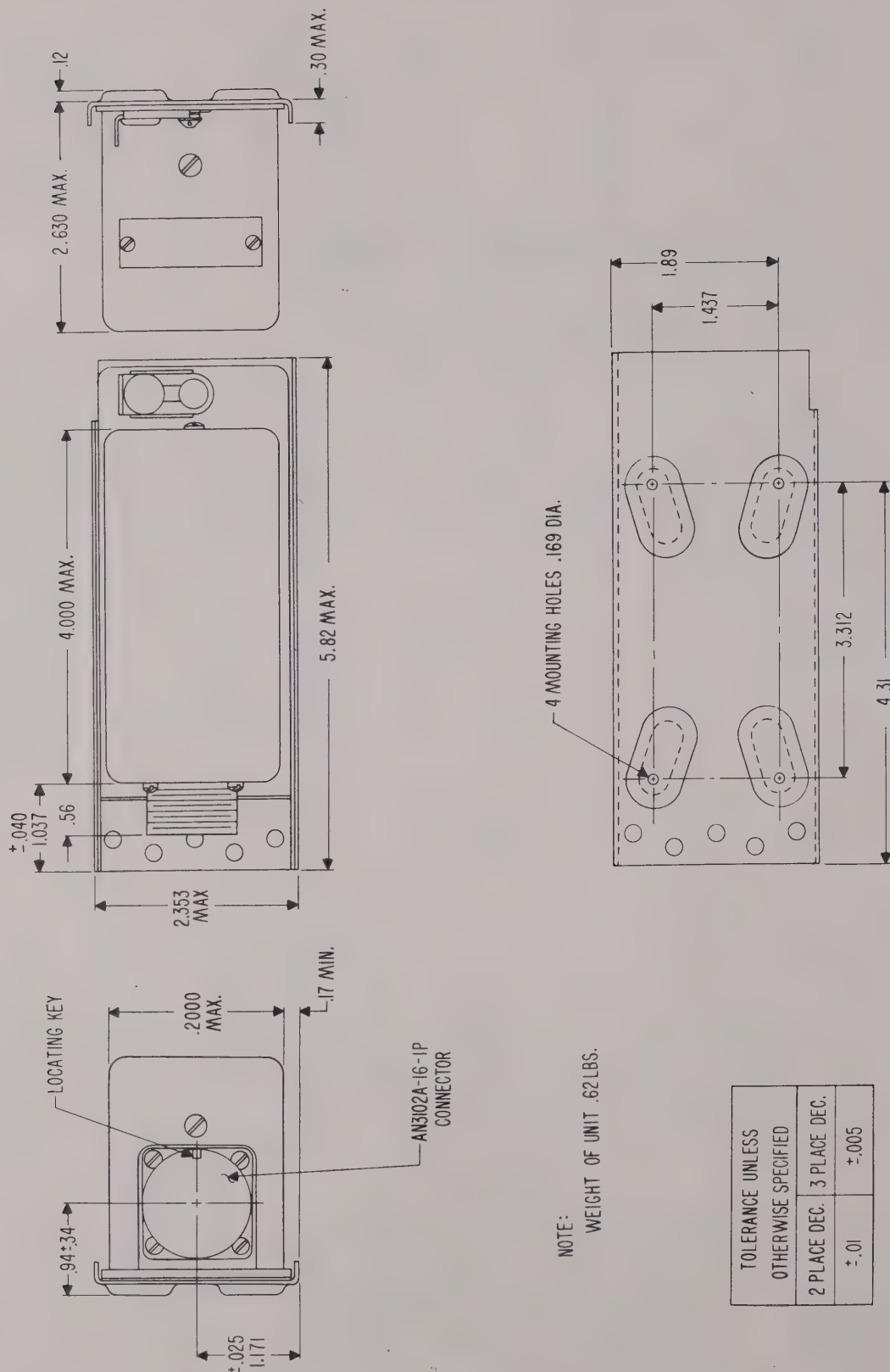


Figure 3-8. RMA-21B RMI Amplifier, Outline Drawing

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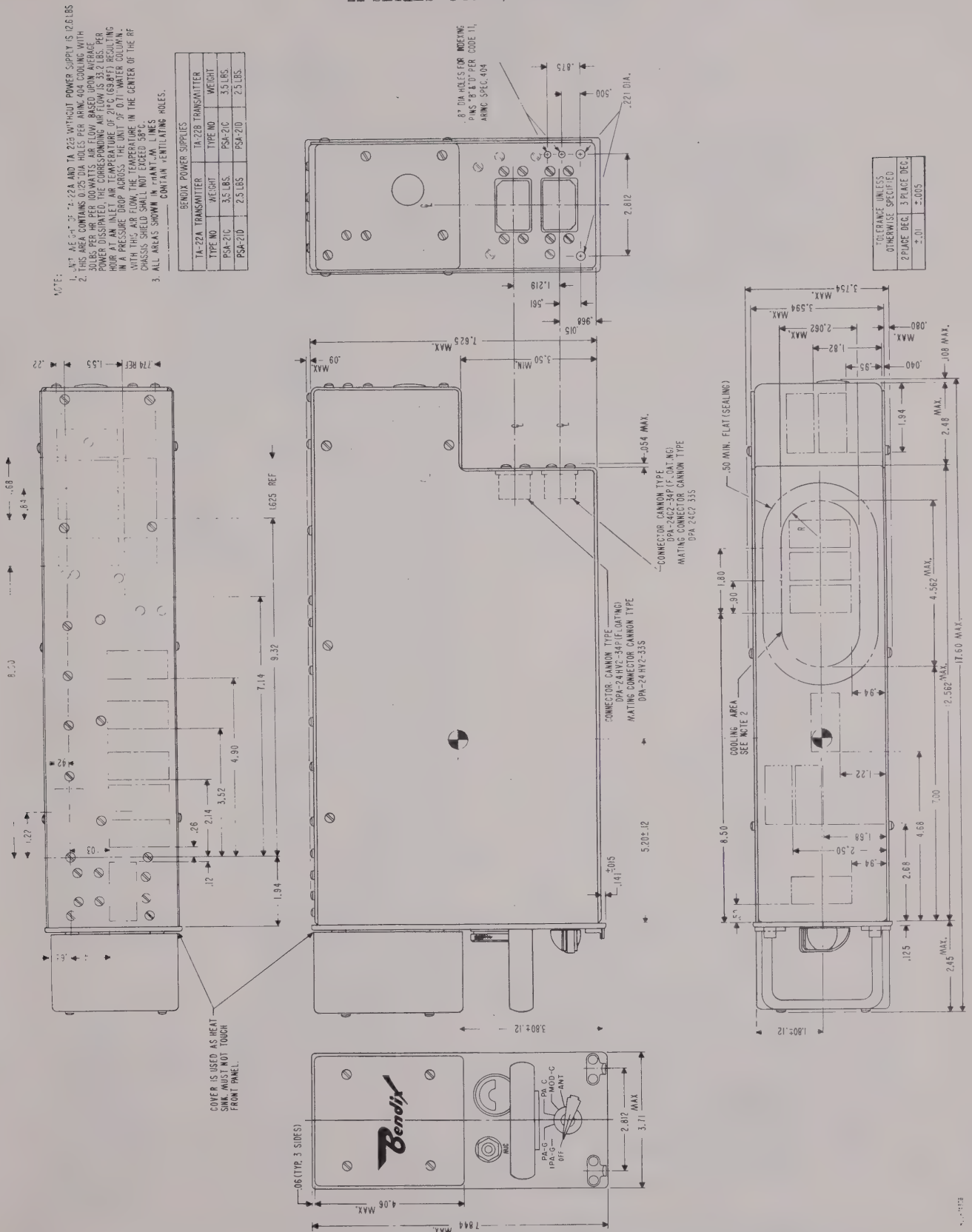


Figure 3-9. TA-22() VHF Transmitter, Outline Drawing

"22 SERIES" COM^{INT}/NAV SYSTEMS

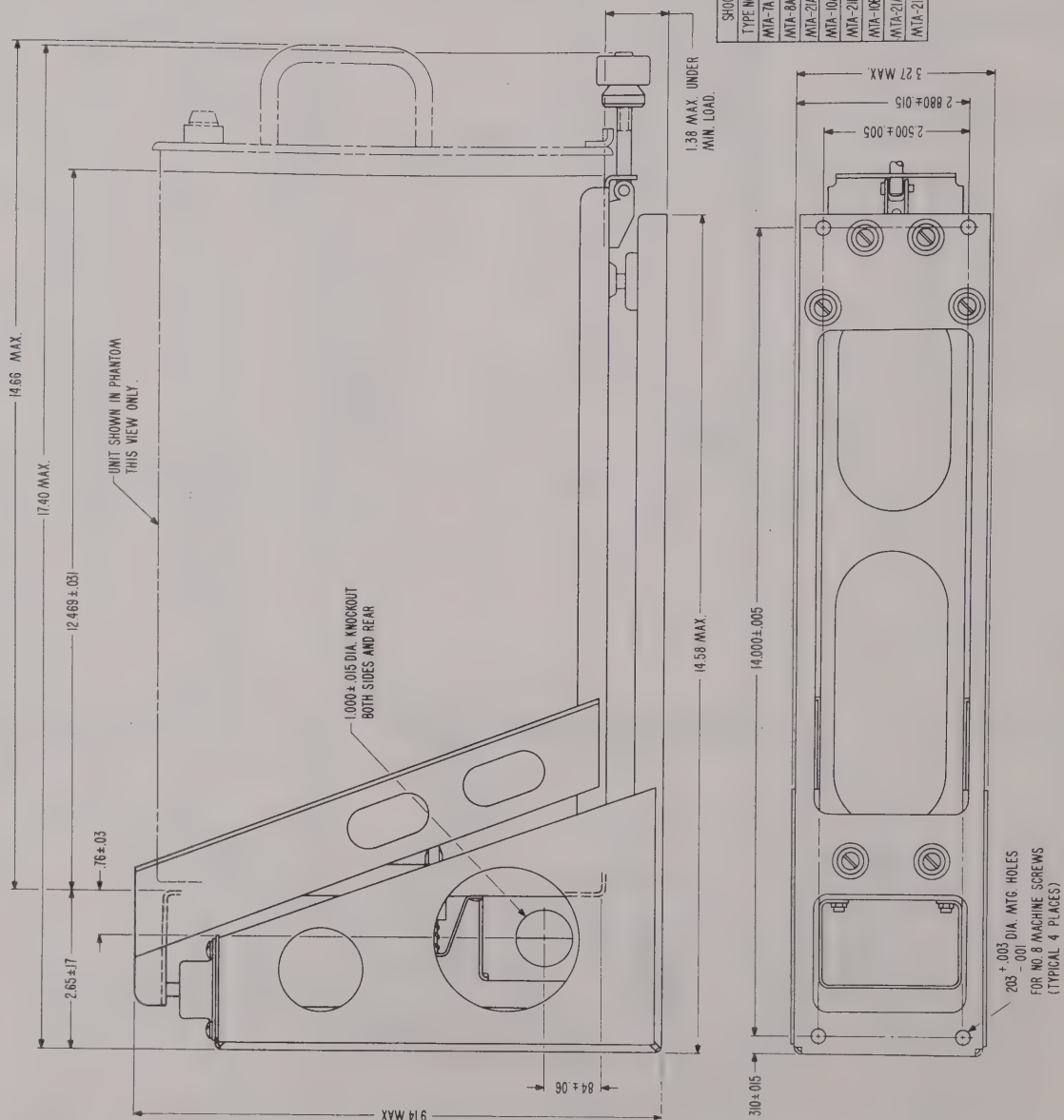


Figure 3-10. MTA-21A/-21E Shockmount (For Receiver/Navigation Unit), Outline Drawing

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SHOCKMOUNT		EQUIPMENT USED WITH		CONNECTOR		INDEX PINS	
TYPE NO.	WEIGHT	TYPE NO.	WEIGHT	TYPE NO.	POSITION	CODE No.	POSITION
MTA-21EG	1.6 LB.	NVA-22A	9.2 LB.	DPA-32-33S	UPRIGHT	29	C & E

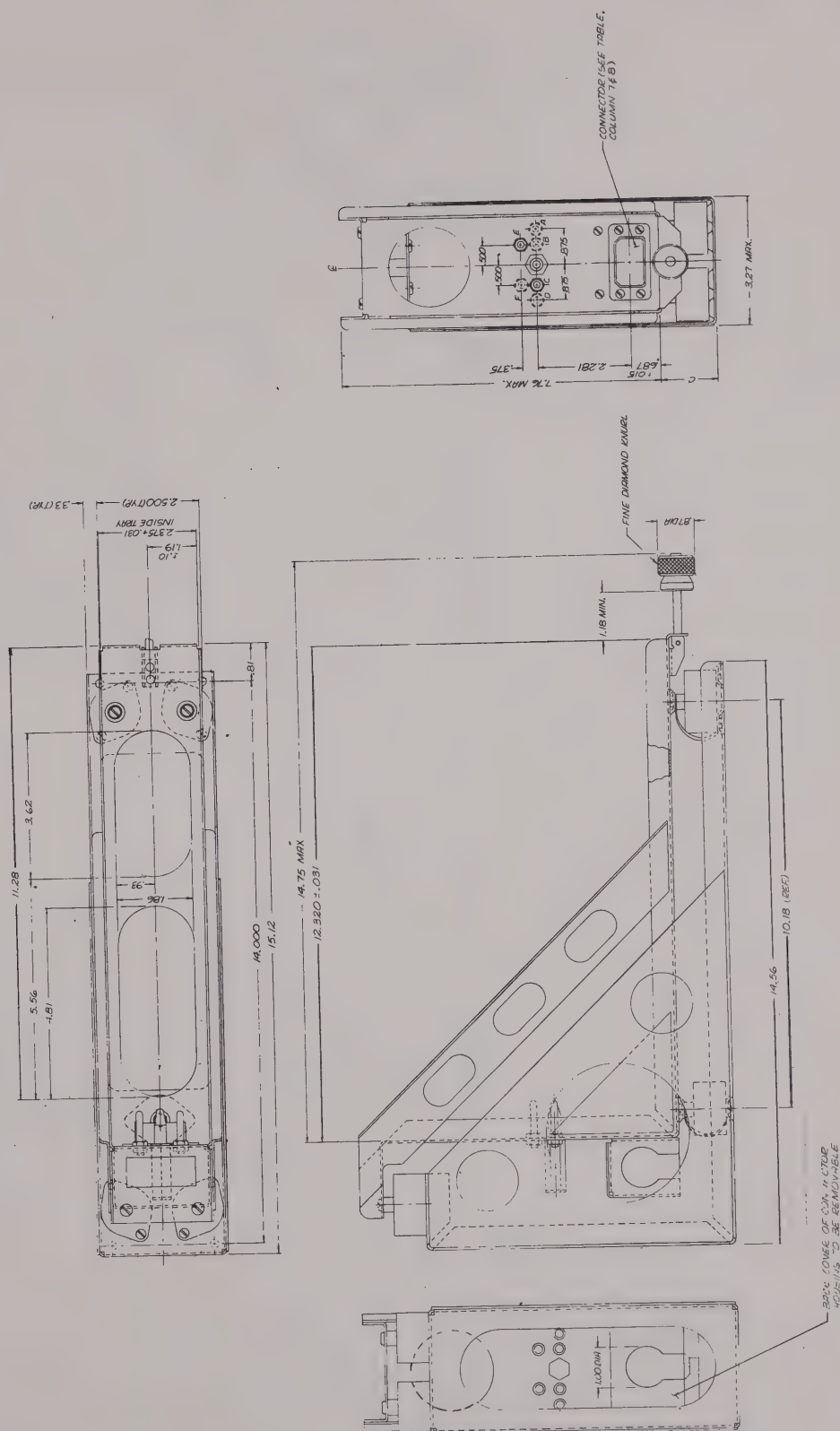


Figure 3-10a. MTA-21EG Shockmount (For NVA-22), Outline Drawing.



1



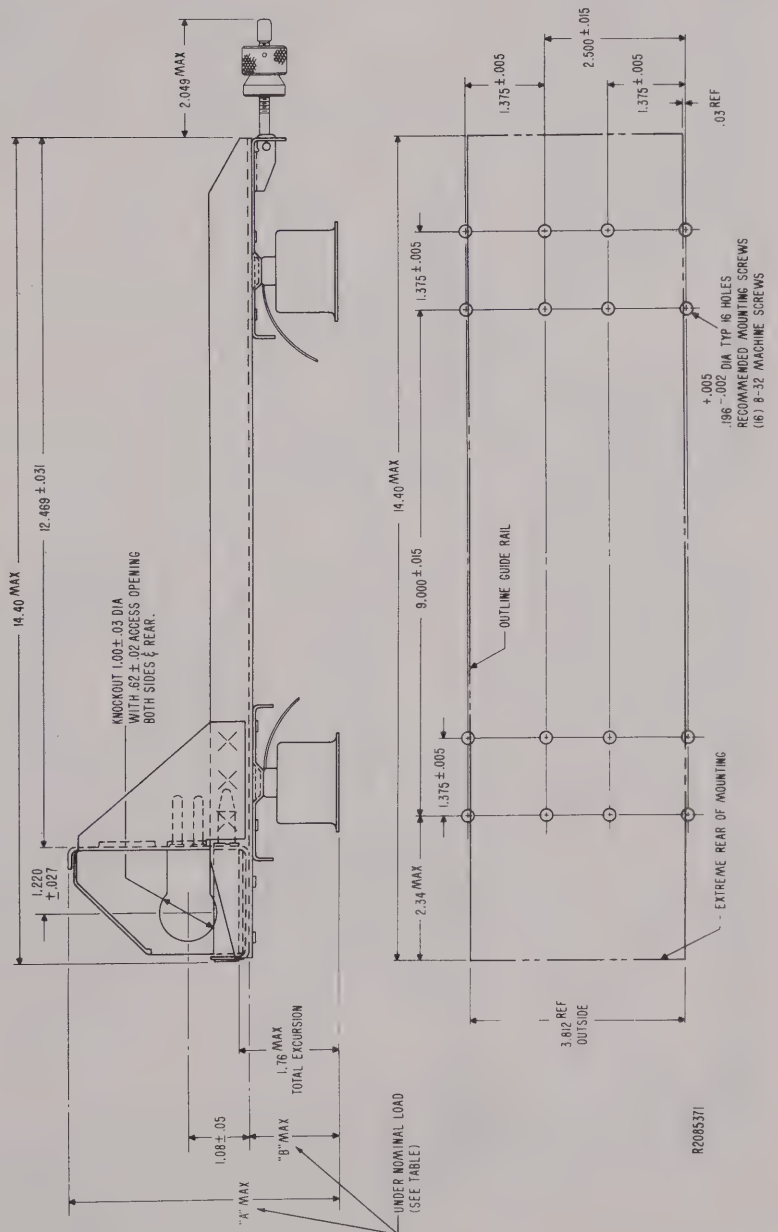


Figure 3-11. MTA-21B Shockmount (For Transmitter), Outline Drawing

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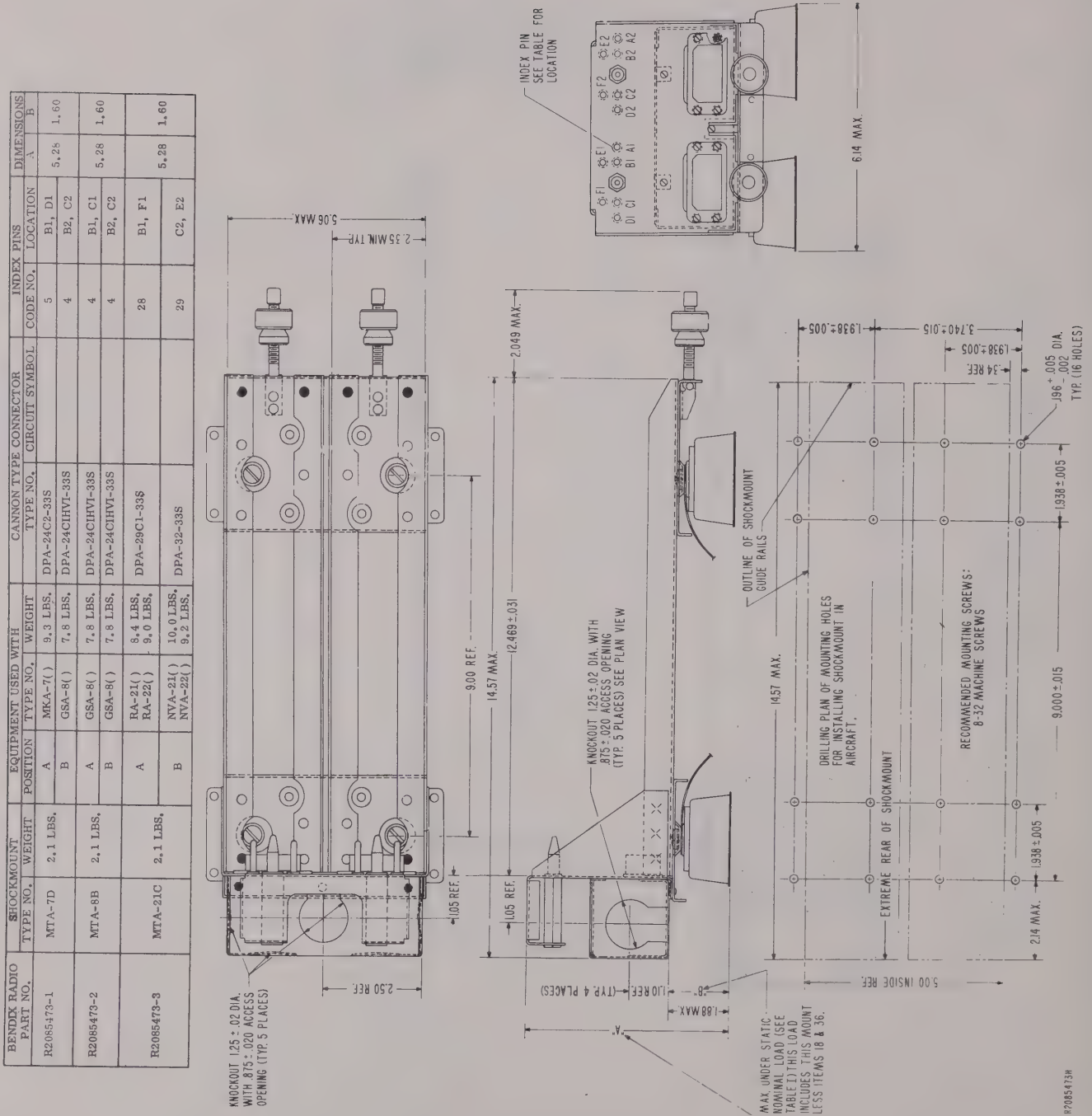


Figure 3-12. MTA-21C Shockmount, Dual (For Receiver and Navigation Unit), Outline Drawing

"22 SERIES" COMM/NAV SYSTEMS



SHOCKMOUNT		EQUIPMENT USED WITH			CANNON TYPE CONNECTOR		INDEX PINS		DIMENSIONS	
TYPE NO.	WEIGHT	POSITION	TYPE NO.	WEIGHT	TYPE NO.	CIRCUIT SYMBOL	CODE NO.	LOCATION	A	B
MTA-21CG	2.1 LBS.	A	RA-21() RA-22()	8.4 LBS. 9.0 LBS.	DPA-29C1-33S		28	B1, F1	5.06	1.36
		B	NVA-21() NVA-22()	10.0 LBS. 9.2 LBS.	DPA-32-33S		29	C2, E2		

Figure 3-12a. MTA-21CG Shockmount, Dual (For RA-22 and NVA-22), Outline Drawing

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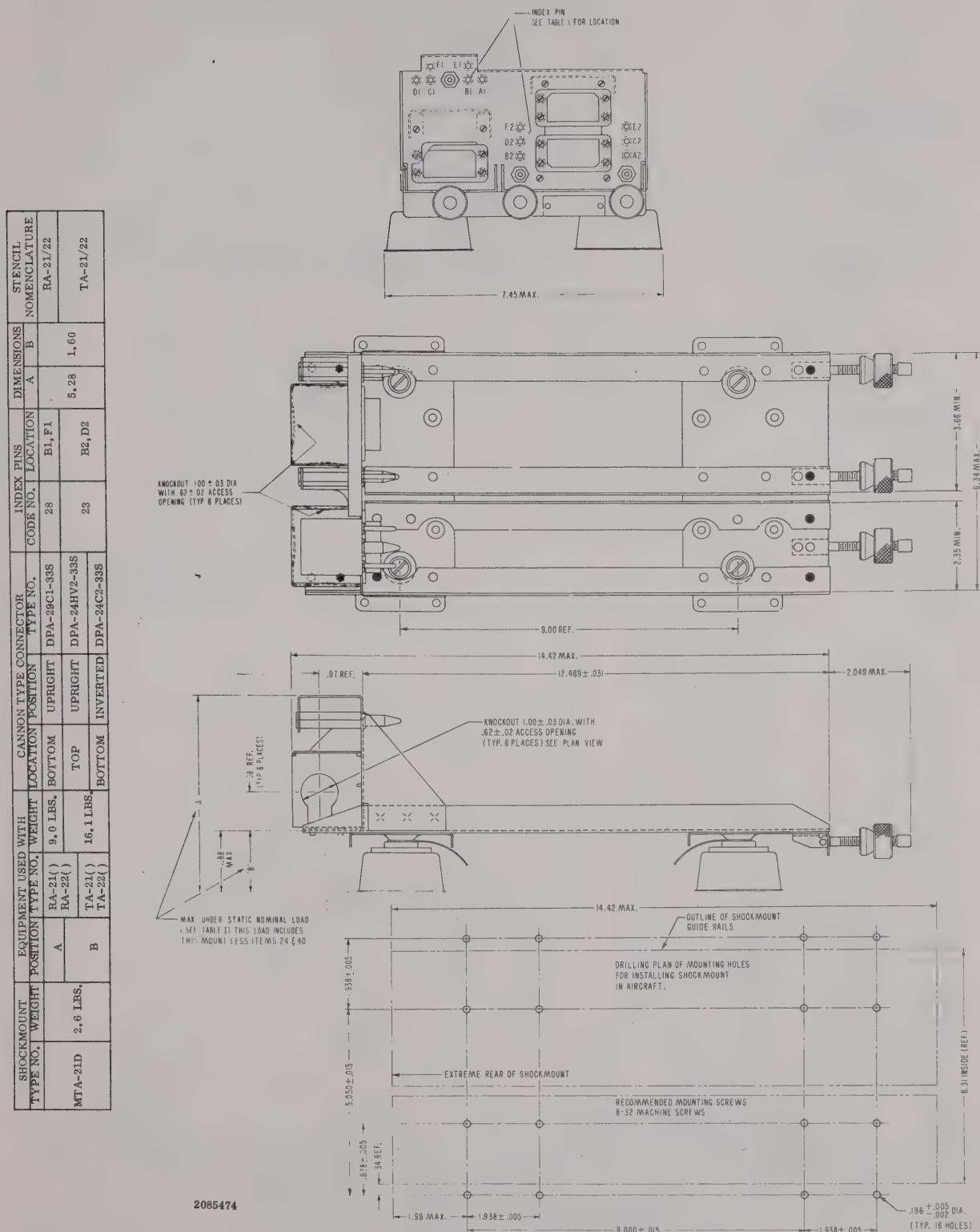


Figure 3-13. MTA-21D Shockmount, Dual (For Receiver and Transmitter), Outline Drawing

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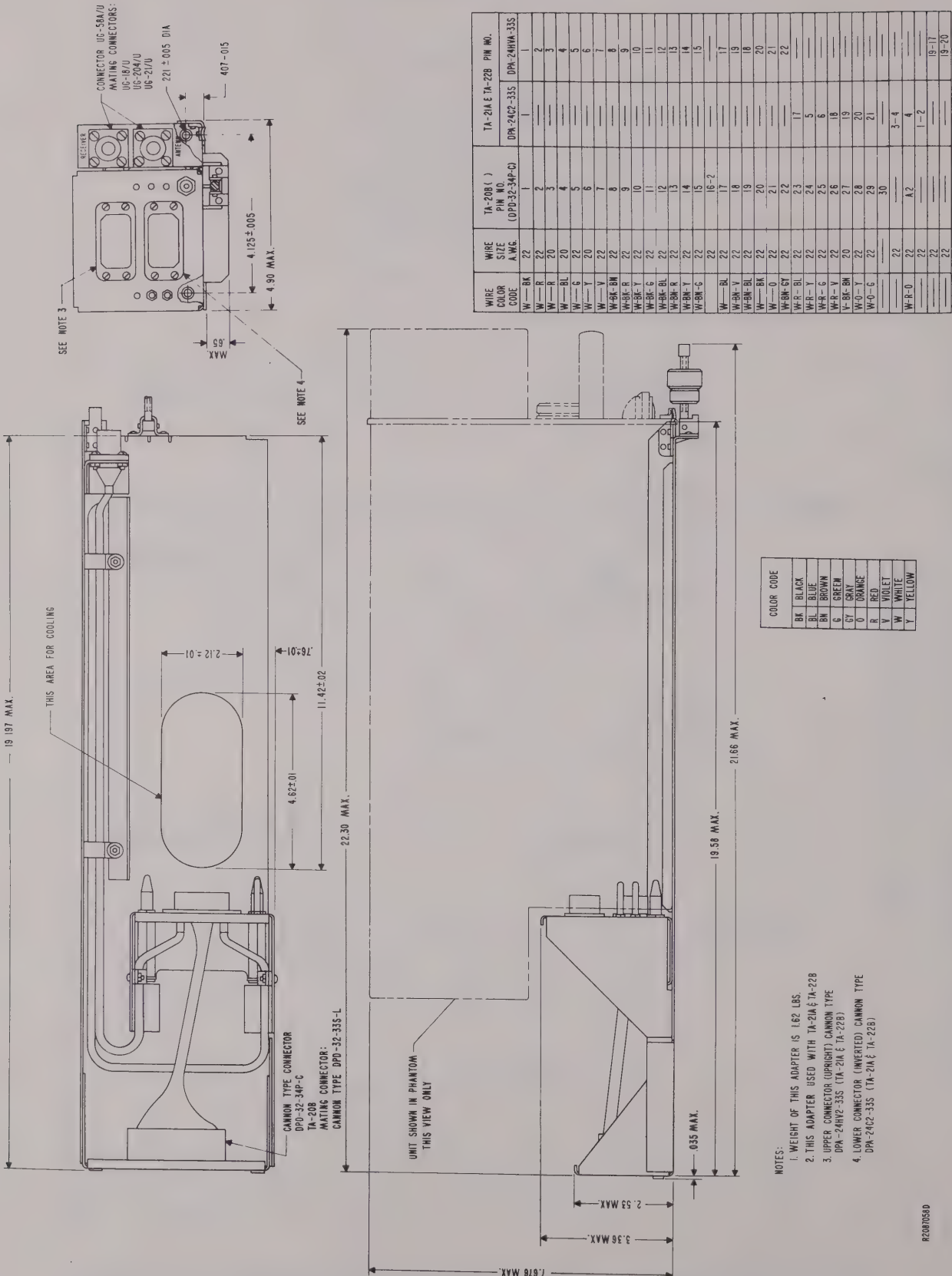


Figure 3-14. Adaptor, Shockmount (1/2-ATR Unit to 3/8-ATR Shockmount), Outline Drawing

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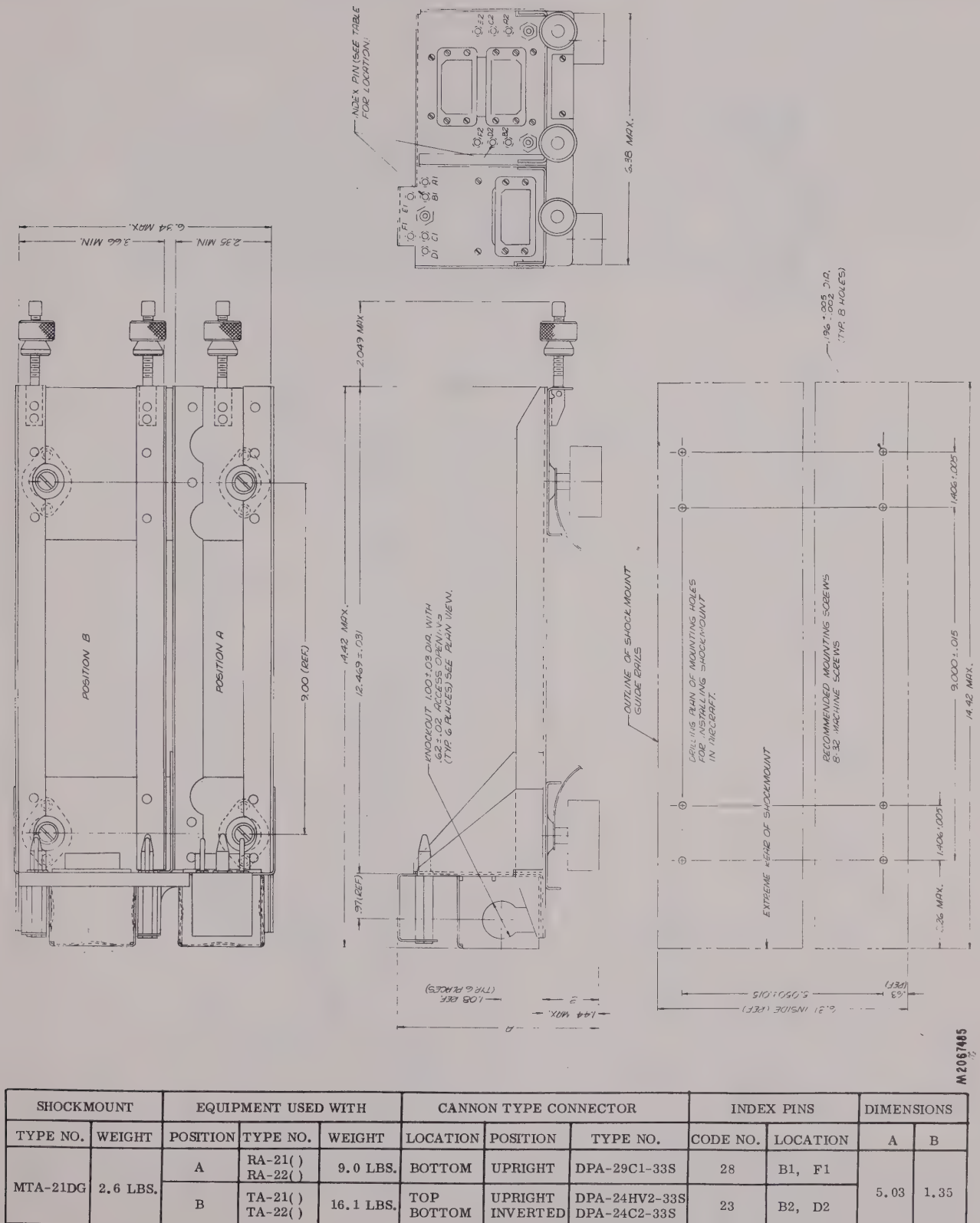


Figure 3-14a. MTA-21DG Shockmount, Dual (For RA-22 and TA-22), Outline Drawing

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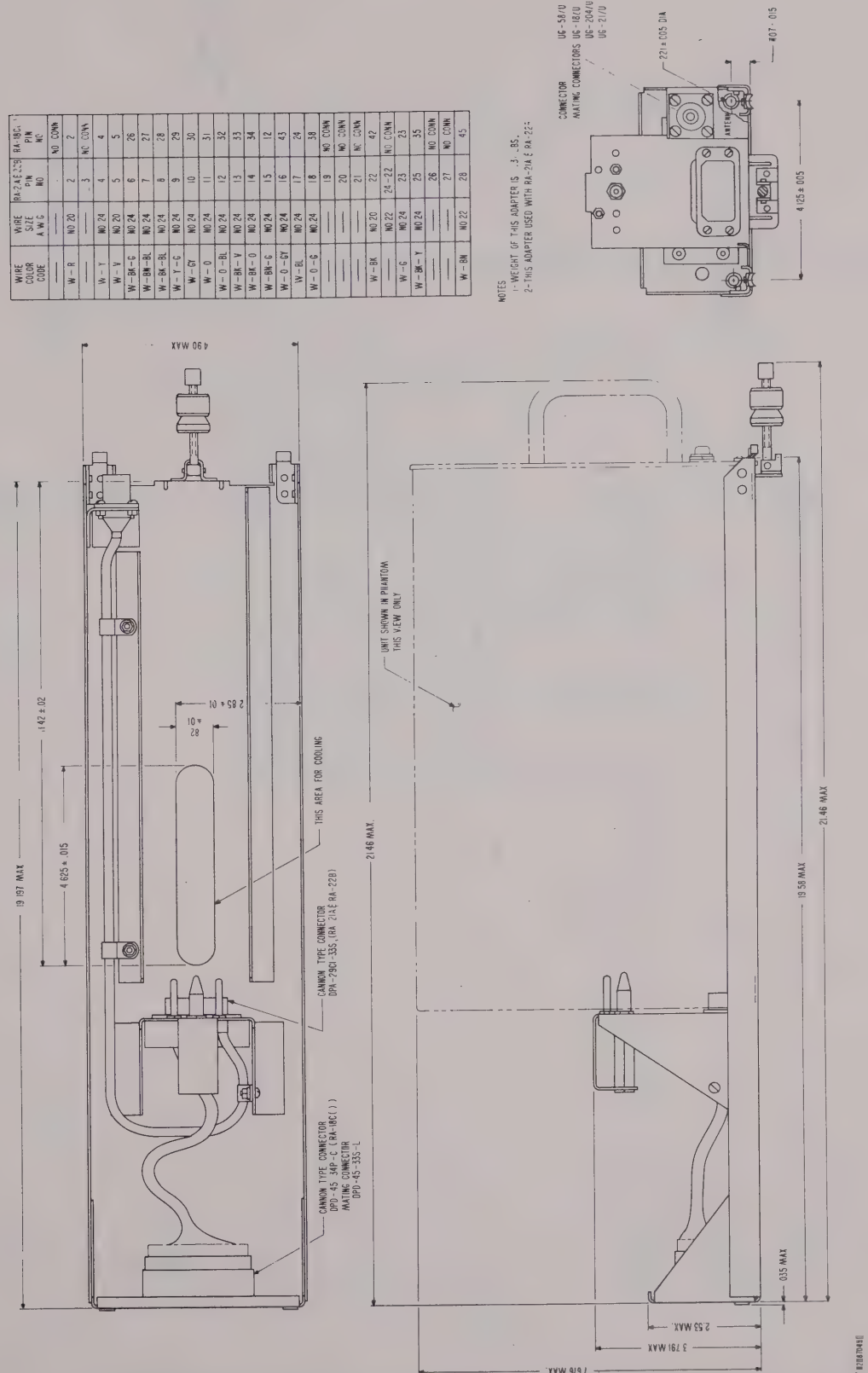


Figure 3-15. Adaptor, Shockmount (1/4-ATR Unit to 1/2-ATR Shockmount), Outline Drawing

'22 SERIES" COMM/NAV SYSTEMS

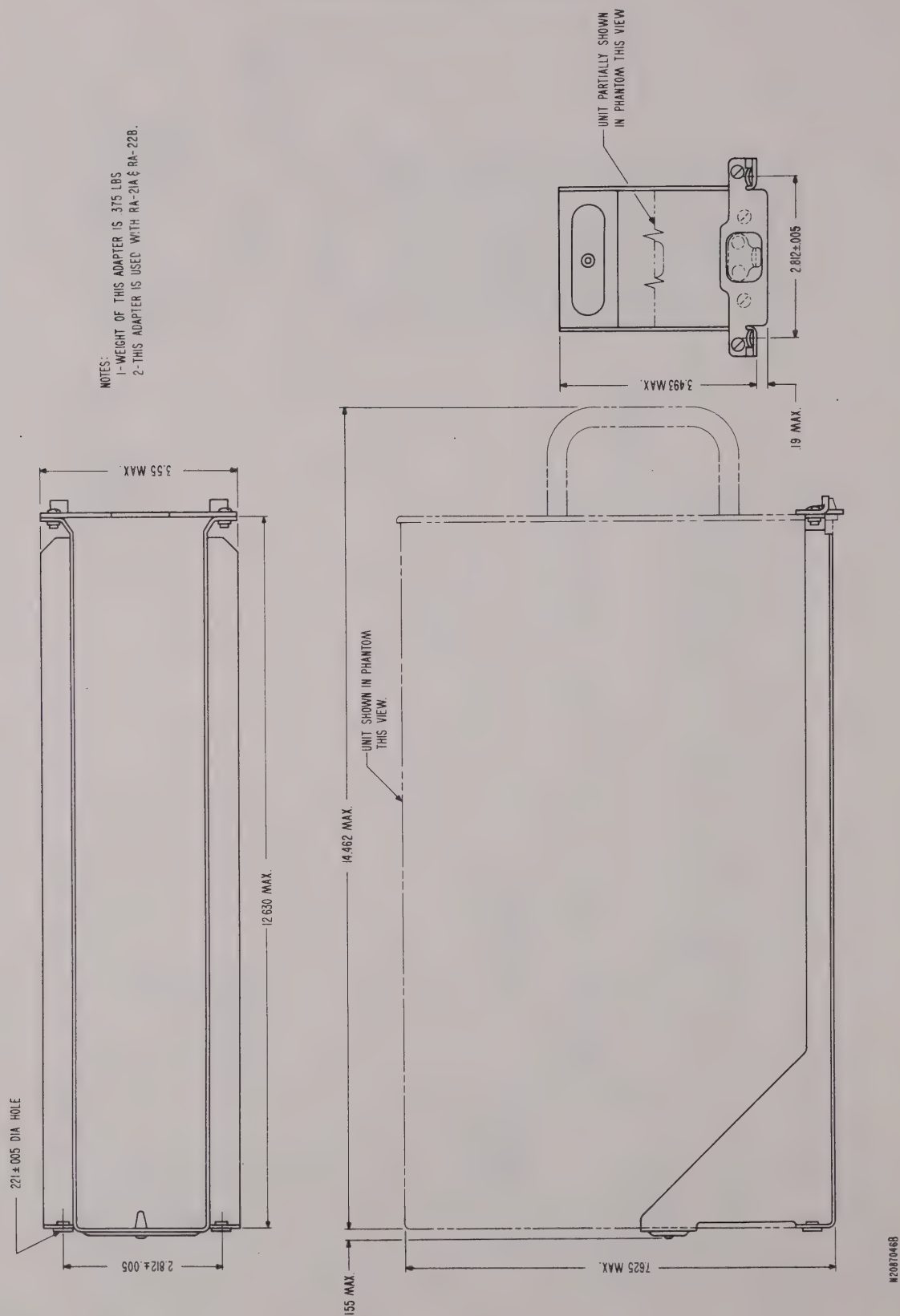
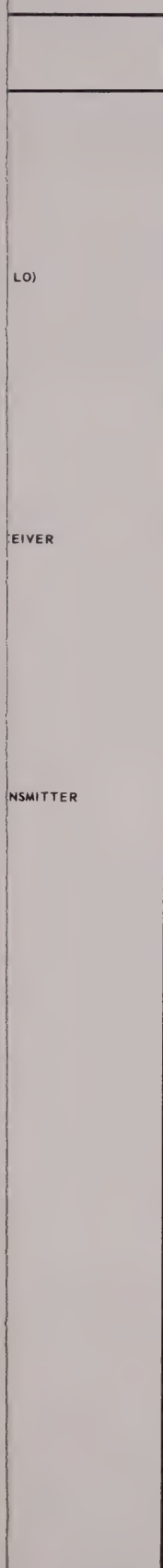


Figure 3-16. Adaptor, Shockmount (1/4-ATR Unit to 3/8-ATR Shockmount), Outline Drawing

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ILLUSTRATIONS
BENDIX "22 Series" COMM/NAV SYSTEMS



NOTES:

1. SHIELDED WIRES INDICATED BY 'S', SHIELDED TWISTED PAIR BY "STP"
2. ALL WIRES AWG NO. 22 UNLESS OTHERWISE NOTED.
3. USE APPROPRIATE WIRE SIZE FOR CURRENT-CARRYING CAPACITY AND/OR VOLTAGE DROP.
4. CONNECT DIRECTLY TO LO SIDE OF A-C SOURCE.
5. RECEIVER PIN 3 IS GROUNDED THROUGH CNA-22YSV-1(1) CONTROL TO EXTEND LOWER END OF COMM FREQUENCY BAND FROM 118.00 MC TO 116.00 MC.
6. COAX RG-58C/U OR RG-141/U.
7. IF USED WITH EXTERNAL B+ SUPPLY REMOVE CONNECTION FROM INTERNAL POWER SUPPLY PLUG TO B+ OF RECEIVER.
8. IN PHASE WITH DEMODULATED OUTPUT FROM SIGNAL GENERATOR BOONTON RADIO MODEL 211A.
9. PIN DESIGNATION ON TA-22B AS FOLLOWS:
SUFFIX "T" TOP CONNECTOR P401
SUFFIX "B" BOTTOM CONNECTOR P402
10. SEPARATE +27.5 V INPUTS PROVIDED FOR TA-22B ONLY.
11. +27.5VDC FROM TA-22B DURING TRANSMISSION.
12. ANY EXTERNAL LOAD CONNECTED TO RA-22B PIN 23 TO BE 100K OHMS MINIMUM OR TO BE ISOLATED BY MEANS OF A DIODE SIMILAR TO PACIFIC SEMICONDUCTOR TYPE PS-010.
13. USED ONLY ON DC OPERATION.
14. MATING CONNECTORS FOR UNITS AS FOLLOWS:
TA-22B; TOP; DPA-24HV2-33S, BOTTOM; DPA-24C2-33S
RA-22B; DPA-29C1-33S.
CNA-22Y(1) } KOA6-21-50SN
CNA-22A(1) }
15. WHEN USED WITH RA-22B, GROUND PIN 20 OF RECEIVER.

Figure 3-17. Single VHF COMM System Interconnecting Wire Chart
Bendix Avionics Division

December 1963

Publication Number
I. B. 1022

SECTION III
ILLUSTRATIONS
"22 SERIES" COMM/NAV SYSTEMS

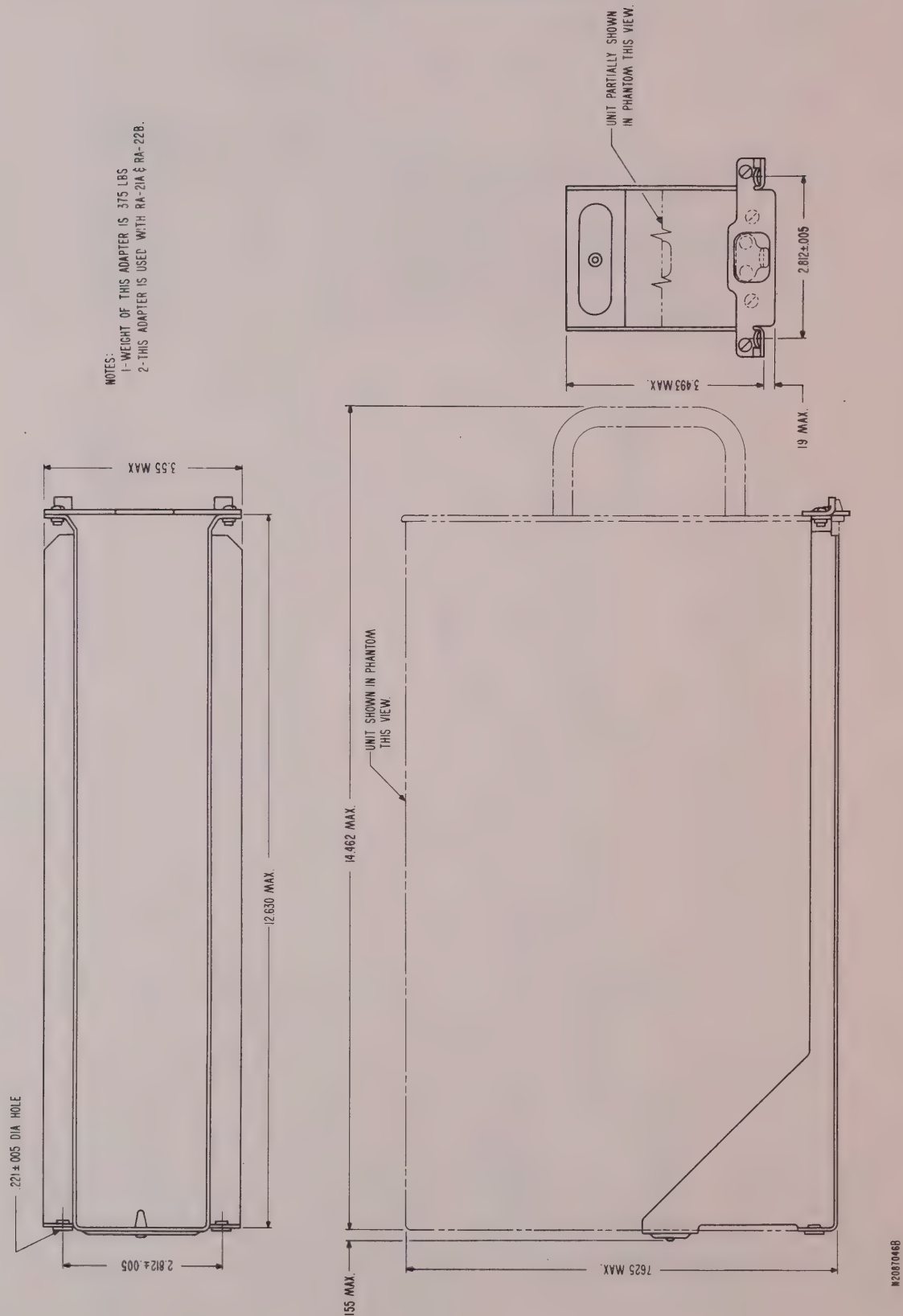


Figure 3-16. Adapter, Shockmount (1/4-ATR Unit to 3/8-ATR Shockmount), Outline Drawing

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ILLUSTRATIONS
BENDIX "22 Series" COMM/NAV SYSTEMS

TA-22B PIN # NOTE 9	RA-22B PIN #	CNA-22Y() PIN #	CNA-22A() NOTE 15		ARINC CODE	WIRE SIZE & TYPE NOTES 1,2	FUNCTION
T3, T4 T19 B2 T5 T6, NOTE 4	2 2B 22					NOTE 3 NOTE 3 NOTE 3 NOTE 3 NOTE 3	+27.5 VDC POWER SUPPLY +27.5 VDC CONTROL CIRCUITS, NOTE 10 +27.5 VDC FILAMENTS, NOTES 10, 18 115 VOLTS, 300 TO 1000 CYCLES, HI 115 VOLTS, 300 TO 1000 CYCLES, LO
T1, T2, B1 B19	22 5 3	48 39 43 38 49 50	48 39 43 38 49			NOTE 3	GND (D-C) AUDIO GND (AUDIO OUTPUT LO, SIDETONE LO) DIAL LIGHTS (27.5 V) PANEL LIGHTS (27.5 V) POWER RELAY COMM/NAV TRANSFER EXTENDED FREQUENCY RANGE CONTROL
	20 6 7 8 9 14	9 1 2 7 8 14	1 2 7 8 14		H A B C D J		UNIT MC CONTROL ODD MC CONTROL
	17 10 11 12 13	15 4 5 6 10	15 4 5 6 10		M E F G H		EVEN MC CONTROL TENTH MC CONTROL
B7 B8 B9	15 16	11 12 16 22 23	11 12 16 22 23		K L A B C		ODD 50-KC CONTROL EVEN 50-KC CONTROL
B10 B11 T17 B3 B4		24 30 31 13 17	24 30 31 13 17		D J M E F		UNIT MC CONTROL ODD MC CONTROL EVEN MC CONTROL
B5 B6 B12 B22 T7		18 19 20 21 32	18 19 20 21		G H K L H		TENTH MC CONTROL ODD 50-KC CONTROL EVEN 50-KC CONTROL EXTENDED FREQUENCY RANGE CONTROL
T20	19 27 25 24 23	26 25	26 25			STP STP	+27.5 V AVAILABLE ON COMM. CHANNELS +27.5 V AVAILABLE ON ILS CHANNELS REMOTE SQUELCH HI REMOTE SQUELCH LO REC DISABLING, NOTES 11, 12
T18 B20 B21	18 4	44	44			S S S S	OUTPUT TO NVA-21A AND/OR ATCSS AUDIO OUTPUT HI, NOTE 8 MIC CONTROL (PTT), CONNECT TO MIC TIP AUDIO INPUT, CONNECT TO MIC RING ATCSS KEYING
B17 B13 B14 B15, B18 BA1		47	47			S S S S NOTE 6	ATCSS SIGNAL RECEIVER AUDIO, TO AUDIO MIXING CIRCUITS SIDETONE HI, EXTERNAL JUMPER ANTENNA
BA2 T8, T9, T10, T13, T14, T15, T16, T21, T22, B16	3 A1 26 1 21		50			NOTE 5 NOTE 6	GROUND TO RECEIVER ANTENNA, EXTERNAL B+, NOTE 7 GROUND (LAMPS) SPARES SPARES
T11, T12		3, 27, 28, 29, 33, 34, 35, 36, 37, 41, 42, 45, 46,	9, 32, 50, 27, 28, 29, 33, 34, 35, 36, 37, 41, 42, 40, 45, 46				RESERVED

- NOTES:
- SHIELDED WIRES INDICATED BY "S", SHIELDED TWISTED PAIR BY "STP"
 - ALL WIRES AWG NO. 22 UNLESS OTHERWISE NOTED.
 - USE APPROPRIATE WIRE SIZE FOR CURRENT-CARRYING CAPACITY AND/OR VOLTAGE DROP.
 - CONNECT DIRECTLY TO LO SIDE OF A-C SOURCE.
 - RECEIVER PIN 3 IS GROUNDED THROUGH CNA-22YSV-(I) CONTROL TO EXTEND LOWER END OF COMM FREQUENCY BAND FROM 118.00 MC TO 116.00 MC.
 - COAX RG-58C/U OR RG-141/U.
 - IF USED WITH EXTERNAL B+ SUPPLY REMOVE CONNECTION FROM INTERNAL POWER SUPPLY PLUG TO B+ OF RECEIVER.
 - IN PHASE WITH DEMODULATED OUTPUT FROM SIGNAL GENERATOR BOONTON RADIO MODEL 211A.
 - PIN DESIGNATION ON TA-22B AS FOLLOWS:
SUFFIX "T" TOP CONNECTOR P401
SUFFIX "B" BOTTOM CONNECTOR P402
 - SEPARATE +27.5 V INPUTS PROVIDED FOR TA-22B ONLY.
 - +27.5VDC FROM TA-22B DURING TRANSMISSION.
 - ANY EXTERNAL LOAD CONNECTED TO RA-22B PIN 23 TO BE 100K OHMS MINIMUM OR TO BE ISOLATED BY MEANS OF A DIODE SIMILAR TO PACIFIC SEMICONDUCTOR TYPE PS-010.
 - USED ONLY ON DC OPERATION.
 - MATING CONNECTORS FOR UNITS AS FOLLOWS:
TA-22B; TOP; DPA-24HV2-33S, BOTTOM; DPA-24C2-33S
RA-22B; DPA-29C1-33S.
CNA-22Y() } KOA6-21-50SN
CNA-22A() }
 - WHEN USED WITH RA-22B, GROUND PIN 20 OF RECEIVER.

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SECTION III

ILLUSTRATIONS

BENDIX "22 Series" COMM/NAV SYSTEMS

NOTES

1. ALL WIRES AWG #22 UNLESS OTHERWISE NOTED.
2. SHIELDED WIRES ABBREVIATED: "S"
3. SHIELDED TWISTED PAIR WIRES ABBREVIATED: "STP"
4. USE APPROPRIATE WIRE SIZE FOR CURRENT - CARRYING CAPACITY AND/OR VOLTAGE DROP
5. COAX RG 58 C/U OR RG 141 /U.
6. INA-21A AND INA-21A-I ONLY.
7. RUN SEPARATE WIRES, ONE FOR EACH PIN, FROM PINS K AND D OF MN-72 () AND PIN 26 OF NVA-22A TO ONE COMMON STUD (SYNCHRO COMMON) CLOSE TO NVA-22A.
8. SEPARATE 27.5 V D.C INPUTS PROVIDED FOR TA-22B ONLY.
9. PIN DESIGNATION ON TA-22B AS FOLLOWS:
SUFFIX "T": TOP PLUG P 401
SUFFIX "B": BOTTOM PLUG P 402
10. CONNECT TA-22B PIN T6 DIRECTLY TO LO SIDE OF A-C SOURCE.
11. FOR NAV DISABLING AND ANTENNA TRANSFER
12. COMM/NAV TRANSFER SWITCH AND VOR-CHECK SWITCH INCLUDED IN CHA-22YSV ONLY.
13. LESS RESISTANCE FOR MORE SENSITIVITY.
14. +27.5 V D.C FROM TA-22B DURING TRANSMISSION. ANY EXTERNAL LOAD CONNECTED TO RA-22B PIN 23 TO BE 100 K OHMS MINIMUM OR TO BE ISOLATED BY MEANS OF A DIODE SIMILAR TO PACIFIC SEMICONDUCTOR TYPE PS-010.
15. IN PHASE WITH DEMODULATED OUTPUT FROM SIGNAL GENERATOR BOONTON RADIO MODEL 211-A.
16. RESERVED
17. A SEPARATE CONNECTOR.
18. IF USED WITH EXTERNAL B+ SUPPLY REMOVE CONNECTIONS FROM INTERNAL POWER SUPPLY PLUG TO B+ OF RECEIVER.
19. +27.5 V D.C AVAILABLE ON ILS CHANNELS TO OPERATE GLIDE SLOPE RECEIVER STANDBY RELAY AND SWITCH NVA-22A OR MMA-21A TO ILS OPERATION.
20. ARINC NOTATIONS () WITH CORRESPONDING PIN NUMBERS ARE AS FOLLOWS:
MN-72: F(M), S(H), J(C), M(H), E(C), R(Z'), L(Z')
MN-97: U(H), T(Z), H.
21. UNIT IS DESIGNED TO OPERATE NORMALLY THREE 1000 OHMS LOADS IN PARALLEL. IF LESS THAN THREE LOADS ARE USED ONE 1000 OHMS RESISTOR $\frac{1}{2}$ WATT MUST BE SUBSTITUTED FOR EACH LOAD. A 1-VOLT NON-POLARIZED DAMPING CAPACITOR MAY BE CONNECTED ACROSS THE DEVIATION OUTPUT CIRCUIT TO SUIT THE REQUIREMENTS OF A PARTICULAR AIRCRAFT AND INDICATOR.
22. IF ADDITIONAL DAMPING OF THE VERT NEEDLE IS DESIRED FOR VOR CONNECT A 1 VOLT NON-POLARIZED CAPACITOR BETWEEN PINS 28 AND 5 OF NVA-22A.
23. MMA-21A IS AN OPTIONAL SUB-ASSEMBLY IN THE NVA-22A.
24. UNIT IS DESIGNED TO OPERATE NORMALLY TWO 1000 OHMS LOADS IN PARALLEL. IF ONLY ONE INDICATOR IS USED CONNECT ONE 1000 OHM RESISTOR $\frac{1}{2}$ WATT IN PARALLEL.
25. ONLY PINS MARKED "X" AND "XX" ARE USED FOR MMA-21A. PIN 11 (MARKED "XX") CONNECTS TO PIN "H" OF INA-21(). ALL PINS (EXCEPT PIN 11 MARKED "XX") ARE USED FOR NVA-22A.
26. WHEN USED WITH RA-22B, GROUND PIN 20 OF RECEIVER.

TYPICAL INTERCONNECTING CHART
FOR SINGLE VHF
COMM. NAV SYSTEM

INA-21B
INA-21B-I
MMS7-HJ-3
MMS7-HJ-4

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Figure 3-18. Single VHF COMM/NAV System Interconnecting Wire Chart
Bendix Avionics Division

December 1963

Publication Number
I. B. 1022

SECTION III
ILLUSTRATIONS
BENDIX "22 Series" COMM/NAV SYSTEMS

NOTES:

1. SHIELDED WIRES ABBREVIATED: "S".
2. ALL WIRES AWG #22 UNLESS OTHERWISE NOTED.
3. SHIELDED TWISTED PAIR WIRES, ABBREVIATED: "STP".
4. USE APPROPRIATE WIRE SIZE FOR CURRENT-CARRYING CAPACITY AND/OR VOLTAGE DROP.
5. TYPES 1MA-21A AND 1MA-21A-1 ONLY.
6. COAX RG-58C/U OR RG-141/U.
7. IF USED WITH EXTERNAL B* SUPPLY REMOVE CONNECTION FROM INTERNAL POWER SUPPLY PLUG TO B* OF RA-22B.
8. IN PHASE WITH DEMODULATED OUTPUT FROM SIGNAL GENERATOR BOONTON RADIO MODEL 211-A.
9. RUN SEPARATE WIRES, ONE FOR EACH PIN, FROM PINS K AND D OF MN-72 () AND PIN 26 OF NVA-22A TO COMMON GND. CLOSE TO NVA-22A.
10. ARINC NOTATIONS () WITH CORRESPONDING PIN NUMBERS ARE AS FOLLOWS:
MN-72: F(MI), S(H), J(C), M(H), E(C), R(Z'), L(Z'),
MN-97: U(H), T(Z, H).
11. RMA-21A IS AN OPTIONAL SUB-ASSEMBLY IN THE NVA-22A.
12. UNIT IS DESIGNED TO OPERATE NORMALLY THREE 1000 OHM LOADS IN PARALLEL. IF LESS THAN THREE LOADS ARE USED ONE 1000 OHM RESISTOR 1/2 WATT MUST BE SUBSTITUTED FOR EACH LOAD. A 1-VOLT NON-POLARIZED DAMPING CAPACITOR MAY BE CONNECTED ACROSS THE DEVIATION OUTPUT TO SUIT THE REQUIREMENTS OF A PARTICULAR AIRCRAFT AND INDICATOR.
13. IF ADDITIONAL DAMPING OF THE VERTICAL NEEDLE IS DESIRED FOR VOR CONNECT A NON-POLARIZED 1-VOLT CAPACITOR BETWEEN PINS 28 AND 5 OF NVA-22A OR MMA-21A.
14. UNIT IS DESIGNED TO OPERATE NORMALLY TWO 1000-OHM LOADS IN PARALLEL. IF ONLY ONE INDICATOR IS USED CONNECT ONE 1000 OHM RESISTOR 1/2 WATT IN PARALLEL.
15. WIRES FROM PINS A AND D OF MN-72 ARE SHIELDED TWISTED PAIR.
16. SEPARATE CONNECTOR ON MN-97 USE MATING CONNECTORS:
ANS106A-10SL-3S STRIGHT ANS108A-10SL-3S ANGLE.
17. ONLY PINS MARKED "X" AND "XX" ARE USED FOR MMA-21A. PIN 11 (MARKED "XX") CONNECTS TO PIN "H" OF 1MA-21(). ALL PINS (EXCEPT PIN 11 MARKED "XX") ARE USED FOR NVA-22A.
18. WHEN USED WITH RA-22B, GROUND PIN 20 OF RECEIVER.

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Figure 3-19. Single VHF NAV System Interconnecting Wire Chart

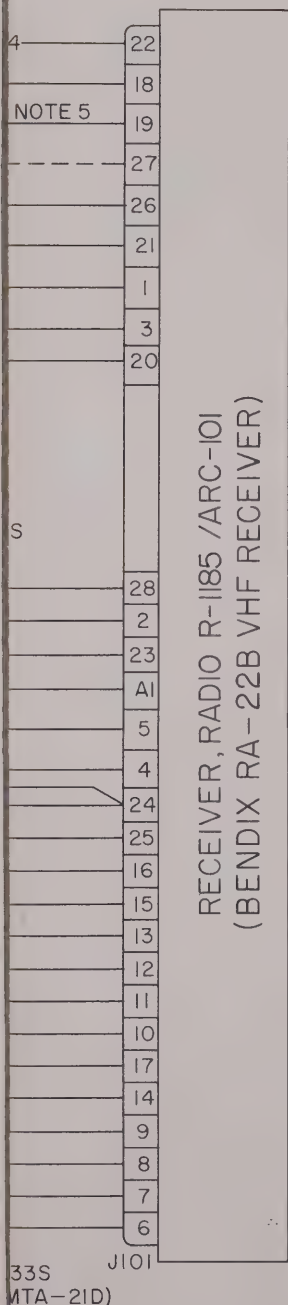
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SECTION III
ILLUSTRATIONS
BENDIX "22 Series" COMM/NAV SYSTEMS

NOTES:

INTERWIRING AS SHOWN IS ALSO COMPATIBLE WITH AN/ARC-84 SYSTEM.

1. SHIELDED WIRES INDICATED BY , SHIELDED TWISTED PAIR BY , COAXIAL CABLE BY .
2. ALL WIRES AWG NO.22 UNLESS OTHERWISE NOTED.
3. USE APPROPRIATE WIRE SIZE FOR CURRENT-CARRYING CAPACITY AND/OR VOLTAGE DROP.
4. CONNECT DIRECTLY TO LO SIDE OF AC SOURCE.
5. ALL AUDIO GROUND LEADS AND SHIELDS SHOULD BE ISOLATED FROM THE AIR FRAME AND RETURNED TO A COMMON GROUND TERMINAL LOCATED NEAR THE RECEIVER, EXCEPT AS OTHERWISE SPECIFIED.
6. VHF ANTENNA ANA-22B IS NOT SUPPLIED AS PART OF RADIO SET, AN/ARC-101 ANA-22B CONNECTOR UG-1094/U MATING CONNECTORS:
 UG-88/U FOR CABLE RG55/U OR RG58/U
7. IF USED WITH EXTERNAL B+ SUPPLY REMOVE CONNECTOR FROM INTERNAL POWER SUPPLY PLUG TO B+ OF RECEIVER.
8. 27.5V DC IS AVAILABLE HERE ON ILS CHANNELS. NOT REQUIRED FOR COMM. SYSTEM.
9. CONNECTOR DESIGNATION ON TA-22B AS FOLLOWS:
 TOP CONNECTOR P401 BOTTOM CONNECTOR P402
10. SEPARATE +27.5V INPUTS PROVIDED FOR TA-22B ONLY.
11. GROUND WIRE RV763 USED ONLY WITH CNA-22 YCS CONTROL GROUND AS CONVENIENT IN RADIO JUNCTION BOX
12. WIRE RV762 FOR POSSIBLE FUTURE USE WITH CNA-22 YSV CONTROL IN COMM/NAV SYSTEM IDENTIFY AND TIE BACK NEAR CONTROL PANEL.
13. 6 MC SHIFT FEATURE PART OF AN/ARC-84 SYSTEM ONLY.
14. SUPPLEMENTAL INSTALLATION DATA ARE CONTAINED IN BENDIX RADIO INSTRUCTION BOOK I.B.1001, PART I FOR "21 SERIES" OR I.B.1022, FOR "22 SERIES".
15. EXTERNAL RELAY PIN DESIGNATIONS AS PER DETAIL DRAWINGS OF AUDIO AND POWER CONNECTIONS.
16. +27.5V DC FROM TA-22B DURING TRANSMISSION.
17. ANY EXTERNAL LOAD CONNECTED TO RA-22B PIN 23 TO BE 100K OHMS MINIMUM OR TO BE ISOLATED BY MEANS OF A DIODE SIMILAR TO PACIFIC SEMICONDUCTOR TYPE PS-010.
18. CONNECT TO EXTERNAL POWER RELAY AS SHOWN ON DETAILED DIAGRAMS FOR TYPICAL POWER CONNECTIONS.
19. USED ONLY ON D.C. OPERATION.
20. MATING CONNECTORS FOR UNITS ARE AS FOLLOWS:
 TA-22B TOP: DPA-24HV2-33S BOTTOM: DPA-24C2-33S
 RA-22B DPA-29C1-33S
 CNA-22YCS KOA6-21-50SN
21. THE BLOCK OF NUMBERS ASSIGNED FOR AN/ARC-101 EQUIPMENT IS RV700 TO RV799. THE HIGHEST NUMBER USED IN THIS DRAWING IS RV763 THE WIRE NUMBER DESIGNATIONS-RV764 THROUGH RV799 ARE RESERVED FOR SPARES.



**Figure 3-20. Radio Set AN/ARC-101, Single COMM System With Remote Squelch Control,
 Interconnecting Wiring Diagram**

ILLUSTRATIONS

NOTES

- INTERFERING AS SHOWN IS ALSO COMPATIBLE WITH AN/ARC-84 SYSTEM
- 1 SHIELDED WIRES INDICATED BY , SHIELDED TWISTED PAIR BY 
- 2 ALL WIRES AWG NO 22 UNLESS OTHERWISE NOTED
- 3 USE APPROPRIATE WIRE SIZE FOR CURRENT-CARRYING CAPACITY AND/OR VOLTAGE DROP
- 4 CONNECT DIRECTLY TO LO SIDE OF AC SOURCE
- 5 ALL AUDIO GROUND LEADS AND SHIELDS SHOULD BE ISOLATED FROM THE AIR FRAME AND RETURNED TO A COMMON GROUND TERMINAL LOCATED NEAR THE RECEIVER, EXCEPT AS OTHERWISE SPECIFIED
- 6 VHF ANTENNA ANA-22B IS NOT SUPPLIED AS PART OF RADIO SET, AN/ARC-101 ANA-22B CONNECTOR UG-1094/U
MATING CONNECTORS
UG-88/U FOR CABLE RG55/U OR RG58/U
- 7 IF USED WITH EXTERNAL B+ SUPPLY REMOVE CONNECTOR FROM INTERNAL POWER SUPPLY PLUG TO B+ OF RECEIVER
- 8 27.5V DC IS AVAILABLE HERE ON ILS CHANNELS NOT REQUIRED FOR COMM SYSTEM
- 9 CONNECTOR DESIGNATION ON TA-22B AS FOLLOWS
TOP CONNECTOR P401 BOTTOM CONNECTOR P402
- 10 SEPARATE +275V INPUTS PROVIDED FOR TA-22B ONLY
GROUND WIRE RV763 USED ONLY WITH CNA-22 YCS CONTROL GROUND AS CONVENIENT IN RADIO JUNCTION BOX
- 12 WIRE RV762 FOR POSSIBLE FUTURE USE WITH CNA-22 YSV CONTROL IN COMM/NAV SYSTEM IDENTIFY AND TIE BACK NEAR CONTROL PANEL

- 13 6MC SHIFT FEATURE PART OF AN/ARC-84 SYSTEM ONLY.
- 14 SUPPLEMENTAL INSTALLATION DATA ARE CONTAINED IN BENDIX RAD INSTRUCTION BOOK 1B 1001, PART 1 FOR "21 SERIES" OR 1B 1022, PART 2 FOR "22 SERIES".
- 15 EXTERNAL RELAY PIN DESIGNATIONS AS PER DETAIL DRAWINGS OF AUDIO AND POWER CONNECTIONS
- 16 +275V DC FROM TA-22B DURING TRANSMISSION
- 17 ANY EXTERNAL LOAD CONNECTED TO RA-22B PIN 23 TO BE 100K OHMS MINIMUM OR TO BE ISOLATED BY MEANS OF A DIODE SIMILAR TO PACIFIC SEMICONDUCTOR TYPE PS-O10
- 18 CONNECT TO EXTERNAL POWER RELAY AS SHOWN ON DETAILED DIAGRAMS FOR TYPICAL POWER CONNECTIONS
- USE ONLY ON DC OPERATION
- 20 MATING CONNECTORS FOR UNITS ARE AS FOLLOWS
TA-22B TOP DPA-24HV2-33S BOTTOM DPA-24C2-33S
RA-22B DPA 29G1-33S
CNA-22YC5 K0A6-11-50SN
- 21 THE BLOCK OF NUMBERS ASSIGNED FOR AN/ARC-101 EQUIPMENT IS RV700 TO RV799. THE HIGHEST NUMBER USED IN THIS DRAWING IS RV763 THE WIRE NUMBER DESIGNATIONS-RV764 THROUGH RV799 ARE RESERVED FOR SPARES.

Figure 3-20. Radio Set AN/ARC-101, Single COMM System With Remote Squelch Control, Interconnecting Wiring Diagram

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"22 SERIES" COMM/NAV SYSTEMS

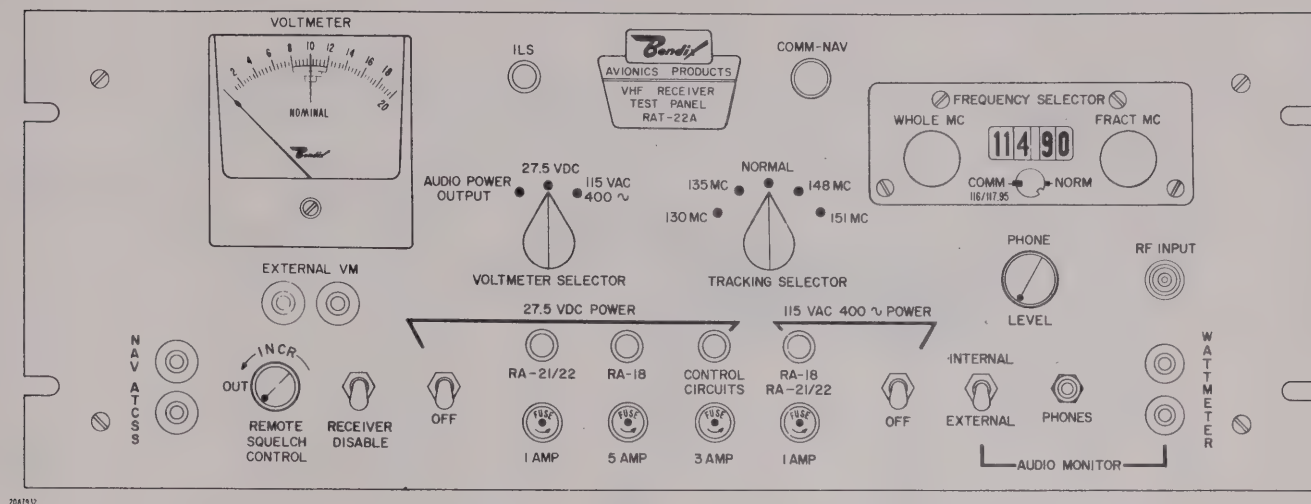


Figure 3-21. RAT-22A VHF Receiver Test Panel, Front Panel

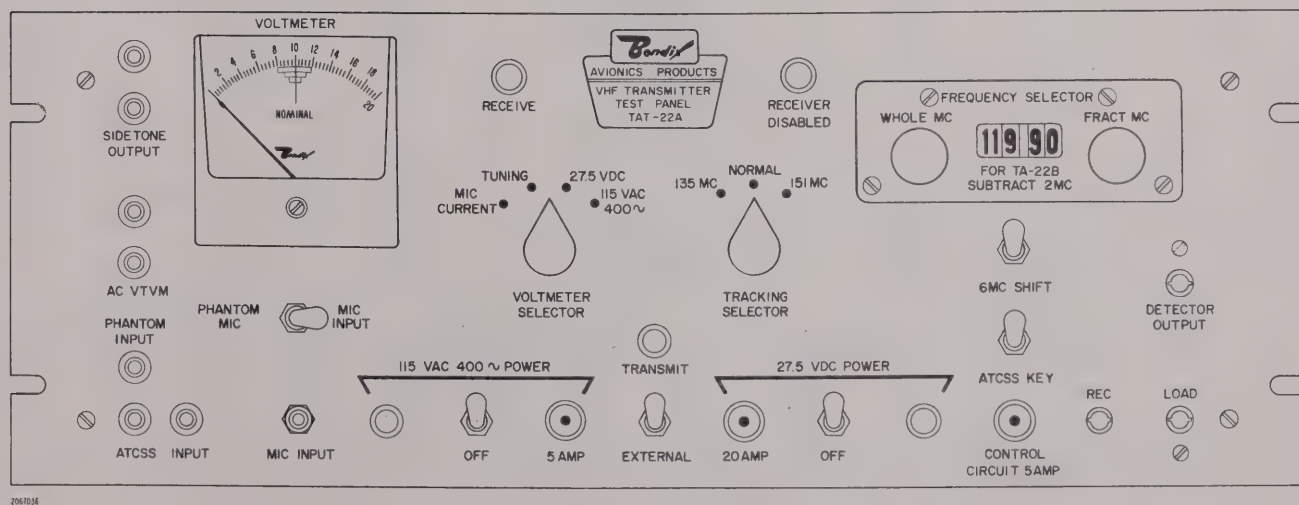


Figure 3-22. TAT-22A VHF Transmitter Test Panel, Front Panel

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"22 SERIES" COMM/NAV SYSTEMS

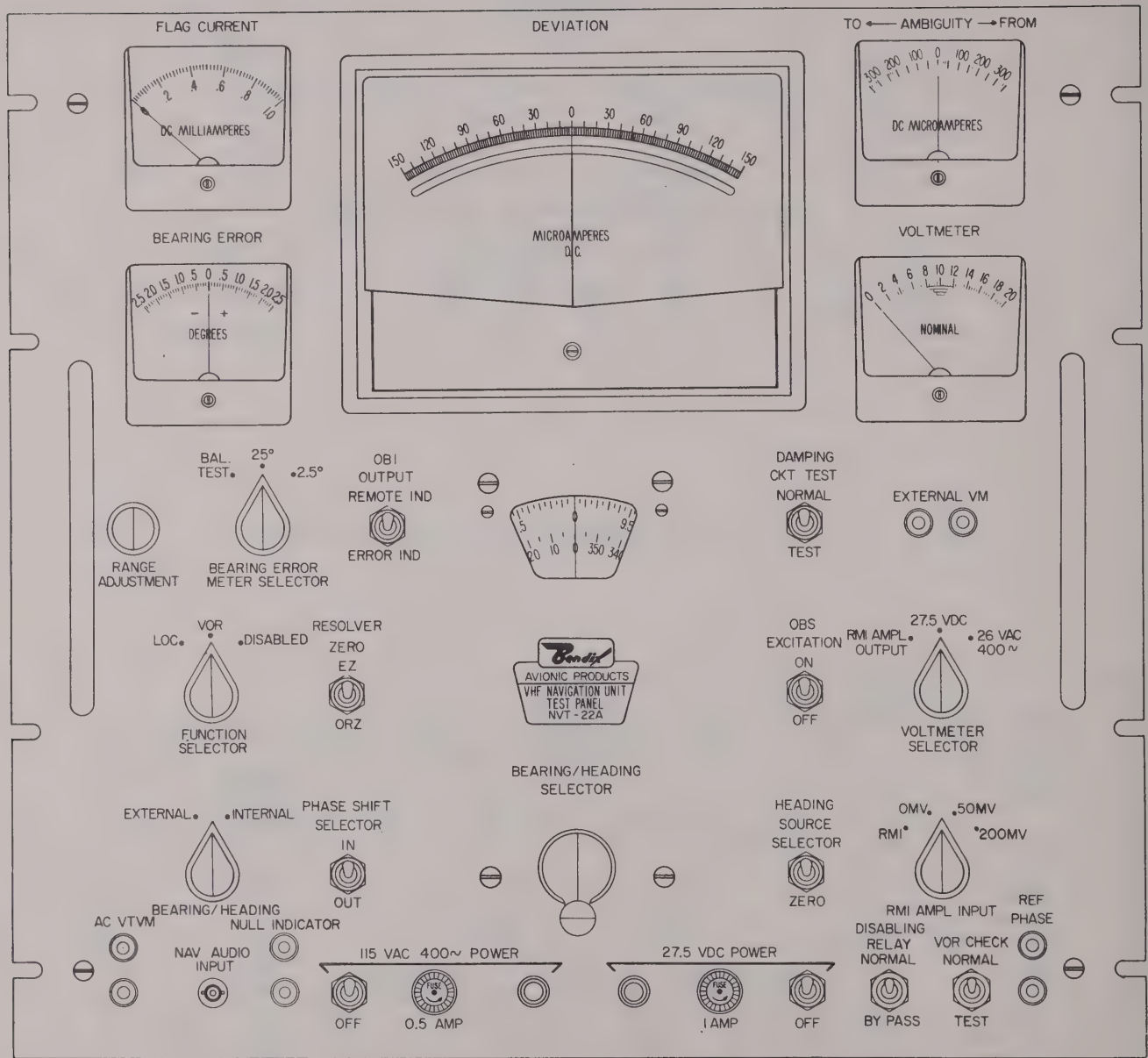


Figure 3-23. NVT-22A VHF Navigation Unit Test Panel, Front Panel

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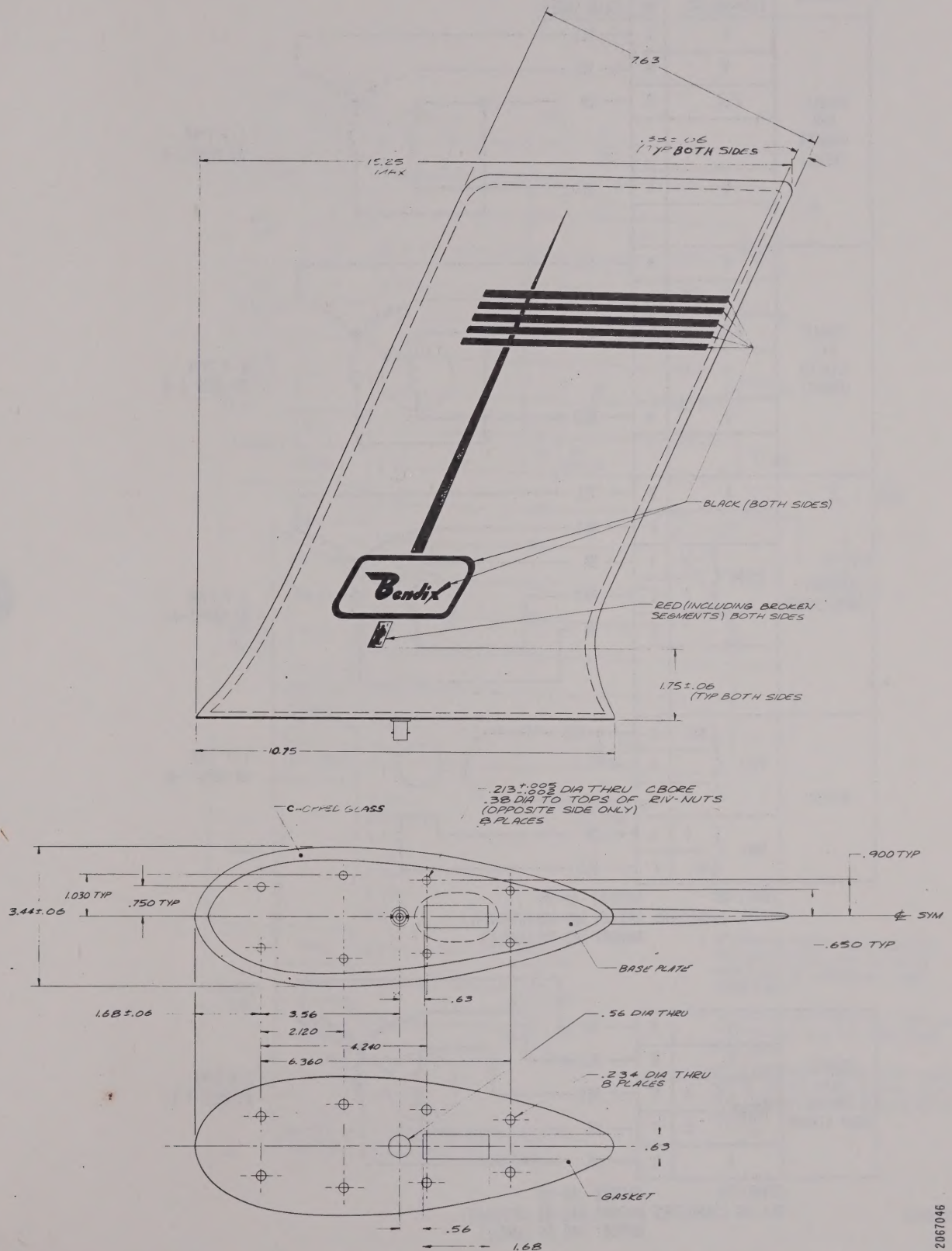


Figure 3-24. ANA-22 () VHF COMM Antenna (116-152mc), Outline Drawing

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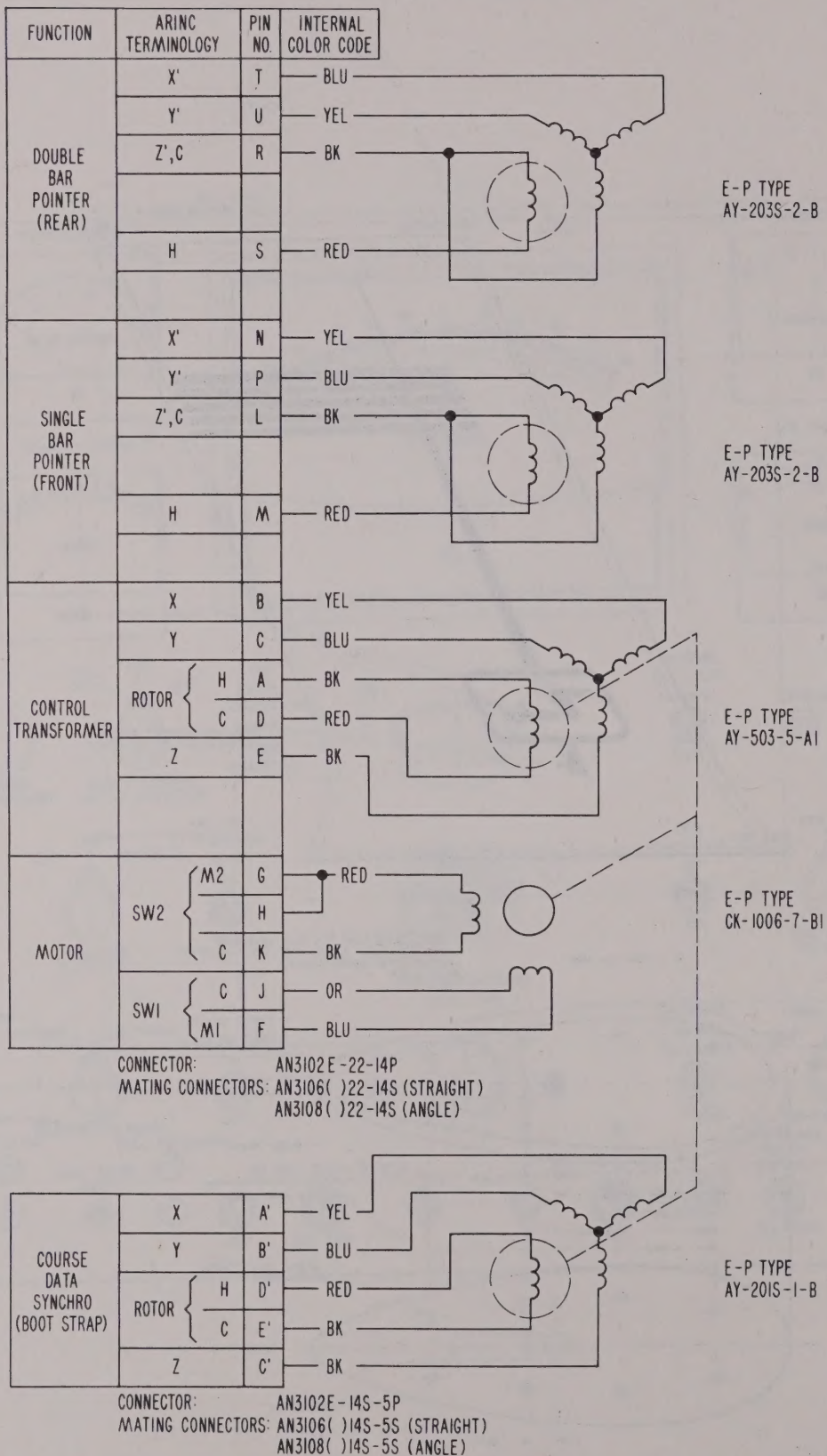


Figure 3-25. MN-72G RMI (Radio Magnetic Indicator), Schematic Diagram

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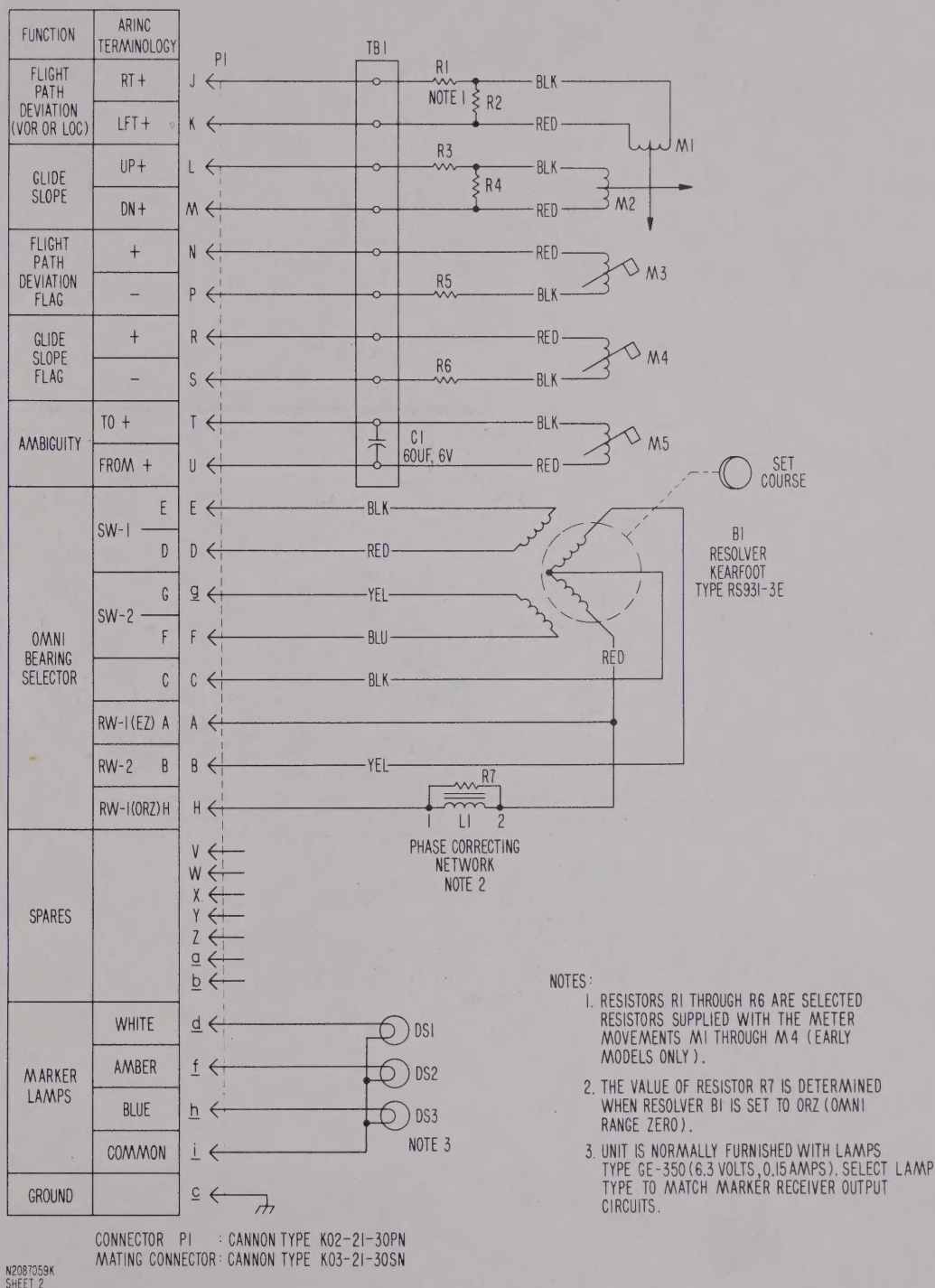


Figure 3-26. INA-21A Indicator, Schematic Diagram

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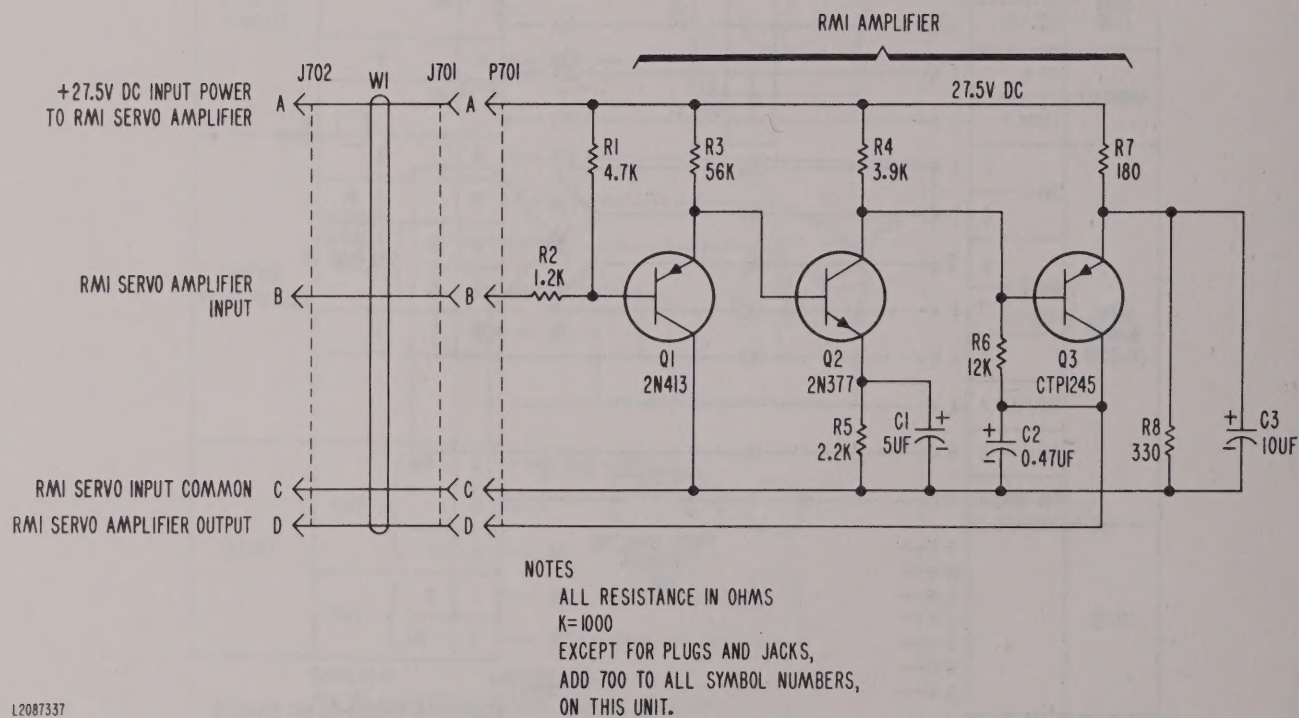


Figure 3-27. RMA-21B RMI Amplifier, Schematic Diagram